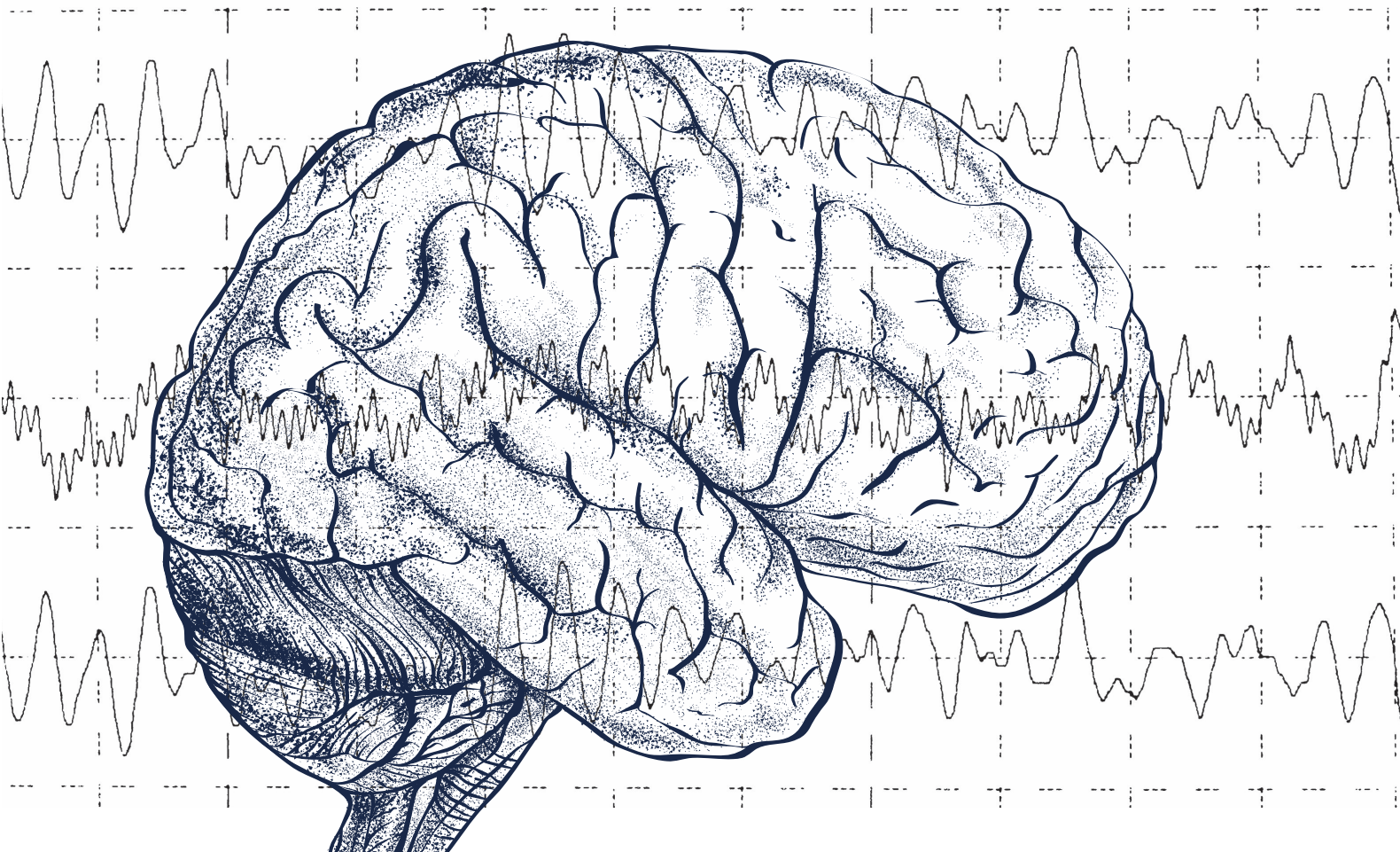


SLEEP

Official Publication of the Sleep Research Society

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37th Annual
Meeting of the
Associated
Professional Sleep
Societies



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Welcome to your preview of SLEEP 2023, the 37th Annual Meeting of the Associated Professional Sleep Societies, which is scheduled to be held in Indianapolis, Indiana on June 3–7, 2023.

This abstract supplement unites the journal SLEEP, and the science of SLEEP 2023. All abstracts presented at SLEEP 2023 are included in this supplement. This year 970 abstracts will be presented at the meeting. 196 will be presented in an oral presentation format, and the remainder will be presented in a poster format. Many authors of oral presentations will also be presenting their science in the virtual poster hall, providing additional time to network with the authors of these important studies. In addition, this abstract supplement contains case reports submitted by individuals in Sleep Medicine Fellowships and other training programs.

Abstracts in this supplement are divided between Basic and Translational Sleep Science, and Clinical Sleep Science and Practice, and then assigned to one of 28 subcategories. Each abstract has a unique four-digit number to facilitate identification and location both within this issue and at SLEEP 2023. The four-digit number in the abstract supplement matches the four-digit code published in the SLEEP 2023 Mobile App.

The SLEEP meeting fosters an environment in which members and attendees learn about the latest basic, translational, and clinical science and technologies, promoting the continued growth of the field through the dissemination of new knowledge. We look forward to seeing everyone and sharing in the success of this pivotal event and hope you consider joining the American Academy of Sleep Medicine and Sleep Research Society in Indianapolis, Indiana in June.

Allan I. Pack, MBChB, PhD
Editor-in-Chief

Abstract citation ID: zsad077.0001

0001**EFFECT OF TIME-RESTRICTED EATING ON ACTIGRAPHY-DERIVED SLEEP PARAMETERS**Daisy Duan¹, Luu Pham¹, Jonathan Jun¹, Ruth-Alma Turkson-Ocran², Scott Pilla¹, Jeanne Clark¹, Nisa Maruthur¹¹ Johns Hopkins University School of Medicine, ² Beth Israel Deaconess Medical Center

Introduction: Time-restricted eating (TRE) is an emerging dietary intervention for weight loss. Sleep can be influenced by timing of food intake. Nevertheless, the impact of TRE on sleep patterns remains under-explored. The Time-Restricted Intake of Meals (TRIM) study was a parallel-arm, controlled feeding trial in 41 adults with obesity and prediabetes or untreated diabetes, randomized to TRE (8am-6pm) or usual eating pattern (UEP; 8am-12am) for 12 weeks, where the primary outcome was weight change. We hypothesized that TRE would cause changes in sleep/wake patterns.

Methods: This was a post-hoc analysis of TRIM using wrist actigraphy data obtained at baseline and week-12. We applied an objective process to determine sleep parameters after sleep estimation (Cole-Kripke) from actigraphy data. We analyzed 6 days/nights of recordings for each participant at each timepoint. Outcomes were sleep duration defined by mean total sleep time per 24-hour period (TST), sleep timing measured by mid-sleep time, sleep onset/offset, and sleep continuity. We used paired t-tests or Wilcoxon signed rank tests to compare data between baseline and week-12 within intervention arms and Mann-Whitney U tests or Wilcoxon signed rank tests to compare changes between intervention arms.

Results: 38 participants (20 UEP; 18 TRE) with adequate actigraphy data (mean age 60 years, 92% female, and 92% Black) were analyzed. Baseline TST (mean±SD) was 394±90 minutes and 386±81 minutes for UEP and TRE, respectively. Week-12 TST was 397±92 minutes and 444±95 minutes for UEP and TRE, respectively. Compared to UEP, TRE increased TST by 55 minutes (p=0.03). TRE shifted mid-sleep time to 44 minutes earlier, from 3:24am to 2:40am (p=0.01), while UEP maintained the same mid-sleep time at 3:15am. Sleep onset shifted from a median of 12:22am to 11:52pm in TRE (p=0.03) while it remained stable in UEP (p=0.97). There were no differences in sleep offset and sleep continuity within and between intervention arms.

Conclusion: Sleep behaviors were different by treatment arm with increased total sleep time and earlier sleep onset in TRE participants. TRE may have ancillary consequences on sleep, which could have clinical implications for sleep regulation.

Support (if any): AHA SFRN 17SFRN33590069 K23DK133690

Abstract citation ID: zsad077.0002

0002**IMPACT OF ACUTE, ISOCALORIC TIME-RESTRICTED EATING ON RESTING METABOLIC RATE AND OBESOGENIC FACTORS IN HEALTHY LEAN ADULTS**Catherine Lowry¹, Sophie Seward¹, Corey Rynders², Josiane Broussard¹¹ Colorado State University, ² Anschutz Medical Center

Introduction: Time-restricted eating (TRE) is a dietary strategy in which energy is consumed over a 6-10h window during the day and is associated with reduced energy intake and subsequent weight loss in people with obesity. However, the impact of isocaloric TRE on obesogenic factors such as hormones related to hunger and appetite, as well as energy expenditure and metabolic rate is relatively unknown. We therefore investigated the impact of 1 week of isocaloric TRE on obesity-related outcomes including circulating leptin, ghrelin, and peptide YY (PYY) and resting metabolic rate (RMR).

Methods: Thirteen healthy adults (8F, 26.9±3.9y, 23.3±2.1kg/m²) participated in a 2-week protocol. During Week 1, energy was consumed over a 13h period with meals individually anchored to habitual wake time and consumed at +1h, +6h, +11h and +14h after wake. For Week 2, participants were instructed to match energy intake from Week 1 but restrict intake to an 8h period (meals at +1h, +5h, and +9h after wake). At the end of each week, participants were admitted to the laboratory for an overnight stay. Blood samples were collected hourly overnight and assayed for leptin, ghrelin, and PYY. RMR was assessed using hood calorimetry immediately after wake.

Results: TRE was associated with a significant reduction in circulating leptin levels (p< 0.001) without changes in body weight (p=0.536), PYY or ghrelin levels. The respiratory exchange ratio (RER) calculated from hood calorimetry was significantly lower during TRE (0.76 vs 0.81; p=0.04) despite no change in energy expenditure (p=0.478) suggesting a higher reliance on fat oxidation during TRE compared with habitual eating.

Conclusion: Reductions in leptin in conjunction with lower RER suggests that TRE promotes increased fat utilization as compared with habitual eating. Future studies should evaluate whether long-term isocaloric TRE is associated with reduced adipose tissue mass.

Support (if any): This project was supported by R01 DK125653.

Abstract citation ID: zsad077.0003

0003

SLEEP AND CIRCADIAN DISRUPTION INDUCED BY SIMULATED NIGHT SHIFT WORK IMPAIR CARDIOMETABOLIC OUTCOMES IN HEALTHY ADULTS

Sophie Seward¹, Janine Higgins², Kenneth Wright³, Josiane Broussard¹¹ Colorado State University, ² University of Colorado Anschutz Medical Campus, ³ University of Colorado, Department of Integrative Physiology, Boulder Colorado

Introduction: People who work evening, night or rotating shifts make up 20% of the US workforce and have a heightened risk for Type 2 diabetes (T2D) and cardiovascular disease (CVD) compared to people who work days, possibly due to repeated bouts of sleep and circadian disruption. However, the mechanism(s) by which sleep and circadian disruption impair cardiometabolic health are unclear. We therefore investigated the impact of acute circadian misalignment on factors related to cardiometabolic health including interstitial glucose concentration, glucose tolerance, resting systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR).

Methods: Ten healthy adults (6F, 25.0±4.5y, BMI: 22.0±2.2kg/m²; mean±SD) participated in an ongoing 6d inpatient simulated night shift protocol to induce sleep and circadian disruption. Participants lived at the Sleep and Metabolism Laboratory for 2d to simulate day shift work followed by 2d of simulated night shift work. Continuous interstitial glucose monitoring was conducted throughout the study (FreeStyle Libre Pro; Abbott, Alameda, CA, USA). BP and HR were assessed 30 minutes after waketime (Omron HEM-FL31; Omron Healthcare, Kyoto, JP) followed by an oral glucose tolerance tests (OGTT) conducted 1.5h after waketime in both conditions.

Results: Simulated night shift work was associated with significantly higher interstitial glucose area under the curve (AUC) in response to an identical first meal after waking (18,299±1412 v 14,606±2035 [mg/dl]*min; p=0.009; mean±SEM) as well as plasma glucose AUC during the OGTT (23,239±2574 v 18,776±1832; p=0.002) compared to simulated day work. Furthermore, simulated night shift work was associated with a significant increase in resting DBP (75±3 v 66±2; p=0.017) compared to day work. No changes were observed in resting SBP (p=0.40) or HR (p=0.11) between conditions.

Conclusion: Sleep and circadian disruption induced by simulated night shift work appear to impair markers of cardiometabolic health, even in healthy, lean adults. Night shift work is largely unavoidable in modern society, thus is it critical to identify strategies or countermeasures to prevent the impact of circadian misalignment on T2D and CVD risk in a large portion of the population.

Support (if any): This project was supported in part by R01DK125653 & F31HL165883.

Abstract citation ID: zsad077.0004

0004

USING APPLE WATCH TO PREDICT CIRCADIAN PHASE IN NIGHT SHIFT WORKERS

Philip Cheng¹, Olivia Walch², Kevin Hannay², Thomas Roth³, Christopher Drake¹¹ Henry Ford Health, ² Arcascope, ³ Henry Ford Hospital

Introduction: A critical obstacle for circadian medicine is the lack of feasibility in measuring circadian phase in the clinic.

Existing tools such as assessment of dim light melatonin onset (DLMO) are too resource intensive, especially in populations with extreme circadian disruption such as night shift workers. Recent studies have demonstrated the validity and feasibility of estimating circadian phase via mathematical modeling data collected with wearable technology. However, these studies have mostly relied on research grade devices (e.g., actigraphs) that have limited scalability. In this work, we validate the use of a consumer wearable (the Apple Watch) to predict DLMO in a population of night shift workers.

Methods: A sample of 21 fixed-night shift workers wore an Apple Watch for two weeks before completing DLMO in the lab. DLMO was assessed via hourly salivary melatonin samples collected in dim light (< 10 lux) for a period of 24 hours. Activity data was used as input into the Hannay model of the circadian clock to produce a predicted DLMO, which was then compared to in-lab DLMO.

Results: Model predictions of DLMO showed high correlation with in-lab DLMO, with a Lin's concordance correlation coefficient (CCC) of 0.81, with a mean absolute error (MAE) of 2.10. This was comparable to the previously published validation using research grade actigraphy (CCC = 0.70; MAE = 2.88).

Conclusion: This study is the first to provide evidence suggesting that estimates of circadian phase using the Apple Watch have comparable validity with research grade actigraphy. These results have significant implications for the scalability of circadian medicine, particularly as consumer-based wearable technology is already commonplace. Apple Watches are also the most common consumer-based wearable device. Future research should extend findings to other wearable devices, especially devices at a lower price-point to increase accessibility.

Support (if any): Support for this study was provided from the American Academy of Sleep Medicine Foundation (245-SR-21) awarded to Dr. Philip Cheng.

Abstract citation ID: zsad077.0005

0005

A CIRCADIAN-INFORMED LIGHTING INTERVENTION MARKEDLY IMPROVES VIGILANCE IN A SIMULATED NIGHT SHIFT SETTING

Hannah Scott¹, Nicole Stuart¹, Jack Manners¹, Alisha Guyett¹, Eva Kemps¹, Bastien Lechat¹, Leon Lack¹, Nicole Lovato¹, Andrew Vakulin¹, Siobhan Banks², Jill Dorrian², Robert Adams¹, Danny Eckert¹, Peter Catcheside¹¹ Flinders University, ² University of South Australia

Introduction: Due to misalignment between circadian timing and the work/rest schedule, cognitive performance during night shift-work is often poor. This study tested a circadian-informed lighting strategy designed to improve on-shift cognitive performance through alerting effects, faster circadian adjustment to the shift-work schedule and promoting more sleep off-shift, compared to standard lighting.

Methods: A randomised controlled, within-subjects, counter-balanced cross-over study was performed to examine circadian-informed versus standard lighting on cognitive performance during a simulated 8-day night shift-work schedule. Nineteen healthy sleepers (12 males/7 females, mean±SD aged 28.7±10.4 years) underwent two separate 8-day experimental conditions in the sleep laboratory. The standard lighting condition mimicked current lighting on submarines (largely dim, blue-depleted light), while the circadian-informed lighting administered

bright, blue-enriched and dim, blue-depleted lighting at times estimated to facilitate rapid circadian delay. After an adaptation sleep opportunity from 22:00 – 07:00 (day 1), participants remained awake for 27 hours to transition to sleeping during the day (10:00 - 19:00) and undertaking simulated night shift-work (00:00 - 08:00) at night on days 3-7. The primary performance outcome was the number of lapses (>500ms responses) on the psychomotor vigilance task (PVT), administered six times across each simulated work shift. Median reaction time and other PVT outcomes were also compared between lighting conditions.

Results: There were significant day-by-condition interactions on PVT lapses, $p < 0.05$. The circadian-informed lighting intervention resulted in ~50% fewer lapses by the final day compared to standard lighting (mean $\pm$ SD 7.4 $\pm$ 5.0 vs. 15.6 $\pm$ 6.1 lapses). Similar effects were observed across other PVT outcomes.

Conclusion: Circadian-informed lighting resulted in markedly better vigilance than standard lighting under simulated night shift-work conditions. These findings indicate the considerable potential for automated lighting interventions to improve performance and safety in shift-workers.

Support (if any): This research is supported by the Commonwealth of Australia as represented by the Defence Science and Technology Group of the Department of Defence through the Research Network for Undersea Decision Superiority (research agreement number: 9334), with additional financial support from Flinders University and lighting provision support from REDARC.

Abstract citation ID: zsad077.0006

0006

CIRCADIAN MISALIGNMENT INCREASES THE IMPACT OF VISCERAL ADIPOSITY ON METABOLIC SYNDROME BURDEN IN ADOLESCENTS

Natasha Morales-Ghinaglia¹, Fan He¹, Jason Liao¹, Susan Calhoun², Alexandros Vgontzas³, Edward Bixler¹, Duanping Liao¹, Julio Fernandez-Mendoza¹

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Introduction: Although insufficient sleep is a known risk factor for metabolic syndrome (MetS), the circadian timing of sleep is also involved in cardiac and metabolic regulation. As a result, circadian misalignment of the sleep-wake cycle, which is highly prevalent in adolescents, may independently impact the burden of MetS in youth.

Methods: We analyzed data from 277 population-based randomly-selected adolescents from the Penn State Child Cohort (median 16 years; 47% female; 21% racial/ethnic minority) who had at least 5 nights of at-home actigraphy (ACT), an in-lab 9-h polysomnography (PSG) and an in-lab dual-energy X-ray absorptiometry (DEXA) scan. Two ACT-measured metrics of circadian misalignment were examined as effect modifiers: sleep midpoint (SM), the intra-individual mean midpoint of the sleep period, and sleep regularity (SR), the intra-individual standard deviation of sleep midpoint. DEXA-measured visceral adipose tissue (VAT) was the primary predictor. A continuous MetS score (i.e., sum of the age and sex adjusted z-scores of waist circumference, blood pressure, HOMA-IR, triglycerides, and HDL cholesterol) was the primary outcome. Linear regression models tested SM and SR as effect modifiers of the association of VAT with MetS, while accounting for sex, race/ethnicity, age, ACT-sleep duration, ACT-sleep variability, and PSG-apnea/hypopnea index.

Results: A significant interaction was found between VAT and SR on MetS (p -interaction=0.05), while not between VAT and SM (p -interaction=0.15). Among adolescents with high sleep irregularity (≥ 45 minutes; $n=164$), each standard deviation increase in VAT was associated with 2.4 (0.2) standard deviations increase in MetS ($p < 0.01$), while this association was weaker among adolescents with low sleep irregularity [< 45 minutes; $n=113$; $\beta=1.7$ (0.3), $p < 0.01$].

Conclusion: An irregular circadian timing of sleep may further increase the impact of visceral adiposity on MetS burden in adolescents. Sleep irregularity, independent of sleep apnea and insufficient sleep, may contribute to the development of cardio-metabolic sequelae associated with central obesity.

Support (if any): National Institutes of Health (R01HL136587, UL1TR000127) and American Heart Association (23PRE1011962)

Abstract citation ID: zsad077.0007

0007

LATER CIRCADIAN PHASE AND INCREASED SLEEP VARIABILITY ARE ASSOCIATED WITH OVERNIGHT BLOOD PRESSURE DIPPING IN CHRONIC SHIFTWORKERS

Brooke Shafer¹, Desirae Christopher¹, Steven Shea¹, Ryan Olson¹, Andrew McHill¹

¹ Oregon Health and Science University

Introduction: Nighttime shift work is associated with adverse cardiovascular outcomes, including hypertension. Increased sleep variability and circadian disruption may increase sympathetic activity and waking blood pressure (BP), potentially constraining typical BP reductions during overnight sleep. However, the relationships between circadian phase, sleep variability, and overnight BP reduction (dipping) among day vs. chronic night-shift workers is unknown.

Methods: Ambulatory BP was monitored for up to 48-hours among 10 dayshift (mean $\pm$ SD; age 33.1 $\pm$ 7.0y; BMI 26.3 $\pm$ 5.4 kg/m²) and 10 chronic (9.3 $\pm$ 6.8y of shiftwork) nightshift workers (age 32.7 $\pm$ 9.1y; BMI 27.9 $\pm$ 7.6 kg/m²). Overnight BP dipping was calculated from the sleeping/waking systolic BP ratio. Variability in sleep timing was defined as the SD of self-reported daily-diary sleep onset across 1-week. Circadian phase was determined by salivary dim-light melatonin onset (DLMO; 3pg/ml threshold). Differences between groups were assessed using independent t-tests and linear mixed-effects models with group and time-from-sleep-onset or circadian phase as fixed-effects, and participant as a random effect. Relationships between overnight BP dipping and DLMO, sleep onset timing variability, and phase angle of entrainment (DLMO to sleep onset during ambulatory BP) were assessed using Pearson correlation analyses.

Results: Chronic nightshift workers had reduced overnight BP dipping (-9.3 $\pm$ 1.5 % vs -13.4 $\pm$ 4.4 %; $p=0.04$), later DLMO timing (21:08 $\pm$ 0:53 vs 19:21 $\pm$ 1:02; $p=0.001$), smaller phase angle of entrainment (3.7 $\pm$ 1.0 h vs 5.0 $\pm$ 0.90 h; $p=0.02$), and greater variability in sleep onset timing (3.2 $\pm$ 1.5 h vs 0.87 $\pm$ 0.34 h; $p < 0.001$). Significant group effects for higher systolic BP across circadian phase and time from sleep onset in the nightshift group were observed compared to dayshift (both $p < 0.05$). DLMO ($r=0.49$; $p=0.04$) and phase angle of entrainment ($r=0.53$; $p=0.02$) were associated with overnight BP dip magnitude (later circadian phase correlated with less dipping). Sleep onset timing variability was negatively correlated with magnitude of overnight BP

dipping in nightshift ($r = -0.76$; $p = 0.04$) but not dayshift workers ($r = 0.26$; $p = 0.61$).

Conclusion: Attenuated overnight BP dipping among chronic nightshift workers may be indicative of increased cardiovascular risk. Chronic circadian disruptions (i.e., smaller phase angle of entrainment) as a function of higher sleep variability among nightshift workers may mechanistically contribute to poorer health outcomes compared to dayshift workers.

Support (if any): R01HL105495, K01HL146992

Abstract citation ID: zsad077.0008

0008

THE ENDOGENOUS CIRCADIAN SYSTEM PROVIDES FOR ENHANCED CORONARY MICROVASCULAR FUNCTION IN THE MORNING.

Saurabh Thosar¹, James Hodovan¹, Babikir Kheiri², Andrew McHill³, Nicole Bowles³, Sean Rice¹, Matthew Butler¹, Jonathan Emens¹, Steven Shea³, Jonathan Lindner⁴

¹ Oregon Health & Science University, ² UCSF, ³ Oregon Health and Science University, ⁴ UVA

Introduction: Major adverse cardiovascular events occur most commonly in the morning compared to other times of the day or night. Evaluation of coronary microvascular reserve perfusion can be used to reflect the anatomic and functional status of the coronary vascular system, both of which contribute to major adverse cardiovascular events. Prior work suggests that coronary microvascular function is attenuated in the morning, but whether the circadian system contributes to this attenuation is unknown.

Methods: To determine if the circadian system drives the morning attenuation in coronary microvascular function, we studied 13 healthy participants (8 females, 5 males; 42 $\pm$ 13 years [mean $\pm$ SD]) in a 5-day forced desynchrony protocol in dim light, where all behaviors and measurements were distributed across the 24-hour cycle. Coronary microvascular function was evaluated by vasodilator myocardial contrast echocardiography, sequentially 16 hours apart, corresponding to each participant's morning, evening and night. We analyzed time-intensity data to calculate microvascular flux rate (beta) at rest and during hyperemia for each measurement. Circadian phases were calculated based on individual dim-light melatonin onsets. We grouped data into three ~8-hour circadian bins corresponding to each participant's morning, evening and night. Mixed model analyses were used to determine if there were significant differences between data collected in the circadian morning compared to the other times while controlling for the measurement schedule and between-subject variability.

Results: There were no significant time-dependent differences in echocardiographic indices of ventricular function, including stroke volume, cardiac output, or myocardial work. Contrary to our hypothesis, hyperemic perfusion was lowest in the evening rather than the morning (2.49 /s vs. 2.82 /s, $p = 0.042$) but not different between morning and night (also 2.82 /s, $p = 0.96$).

Conclusion: In healthy people, there is no circadian-system-driven morning attenuation in coronary microvascular function: indeed, the circadian system facilitates coronary vascular flow in the morning, possibly to accommodate the anticipated behaviorally driven increases in myocardial demand after awakening.

Support (if any): NIH KL2TR002370, R01HL163232, R35HL155681, R01HL140577, R01HL130046, R01HL078610, R01HL156948, K01HL146992, K01HL151745, ULTR00128, Sleep Research Society Foundation, Oregon Institute of Occupational Health Sciences.

Abstract citation ID: zsad077.0009

0009

CIRCADIAN ATHLETIC PERFORMANCE VARIATIONS WHEN TRAVELLING IN THE CANADIAN FOOTBALL LEAGUE

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Introduction: Previous studies have shown a circadian disadvantage in professional sports with teams traveling westward. This effect has been attributed to the circadian clock, core body temperature and associated decline in sports performance in the evening. Compared to the National Football League (NFL) teams, Canadian Football League (CFL) teams often travel longer distances and play at later times. As such, the objective of the present study was to investigate the circadian disadvantage in the CFL.

Methods: Data from 5 years of CFL regular season games were extracted from online databases (2016-2021). Wins, score differentials, first downs, average total, passing, penalty, and kickoff yards, pass completion percentages, interceptions, fumbles, sacks, and time of possession were extracted for both the offense (made) and defense (allowed) for every away evening game (after 6pm; $n = 387$) as well as the direction of the travel (eastward, same time-zone, westward). Two-way ANOVAs of Direction of Travel (eastwards, same time-zone, westwards) on each performance variable were computed to study the circadian effect. Linear regression analyses were done to investigate the effect of the distance travelled by the away team (longitude travelled) on each performance variable.

Results: Significant effects of travel were found for team variables: score differentials ($F[2,386] = 3.86$, $p = .02$) and time of possession ($F[2,386] = 5.42$, $p = .005$). Significant results were also found for offensive variables: first downs ($F(2,386) = 2.91$, $p = .06$), average kickoff return yards ($F[2,386] = 3.54$, $p = .03$), fumbles ($F[2,386] = 2.38$, $p = .09$), and for defensive variables: first downs allowed ($F[2,386] = 2.79$, $p = .06$), average yards per play ($F[2,386] = 4.83$, $p = .008$), average passing yards allowed ($F[2,386] = 3.14$, $p = .04$), average kickoff yards allowed ($F[2,386] = 3.37$, $p = .04$). Each significant post-hoc t-test revealed a circadian disadvantage to teams travelling westwards and a circadian advantage for teams travelling eastwards. Linear regression analyses showed that traveling westward predicts worst performances on some variables, with an increasing effect with distance travelled.

Conclusion: These results are consistent with previous findings showing that professional sports teams travelling westward show important challenges in evening games. In addition, our results highlight the fact that this disadvantage may affect not only the result of the games, but also the performance of players at a more individual level.

Support (if any):

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0010

CIRCADIAN DYSREGULATION OF THE CARDIOPULMONARY SYSTEM IN A MOUSE MODEL OF OBSTRUCTIVE SLEEP APNEA

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Introduction: Intermittent hypoxia (IH) is a condition that occurs in people with obstructive sleep apnea (OSA), in which breathing is repeatedly interrupted during sleep. This can cause a lack of oxygen (hypoxia) in the body. OSA is associated with chronic systemic inflammation, thought to increase the risk of comorbid conditions, including cardiovascular disease. However, the mechanisms behind these pathologic consequences are not well understood. We hypothesize that IH dysregulates the circadian system and heightens inflammatory responses through hypoxia-inducible factors (HIFs), contributing to the end organ damage among patients with OSA. Here, we tested this hypothesis using a mouse model of OSA.

Methods: C57BL/6J background mice were exposed to normoxic or IH conditions for either seven days (short-term) or six weeks (long-term) under 12-hour light and 12-hour dark cycles. After exposure, cardiopulmonary tissues were collected and processed to evaluate circadian transcriptomes, including among HIFs. We also measured protein levels of inflammatory mediators in the heart and lung to compare the effects of short- and long-term exposure to IH. In addition, we measured the real-time circadian physiology of blood pressure, heart rate, activity, and core body temperature using a DSI-telemetry system.

Results: We observed dysregulated circadian systems of the lung and heart following IH exposure. IH also had a negative impact on immune responses in the heart and lung tissue, resulting in a decrease in inflammatory mediators following short-term exposure. However, long-term exposure to IH had the opposite effect, causing an overall increase in inflammatory mediators that contribute to comorbid cardiopulmonary pathologies. In addition, we also observed altered circadian physiology, particularly a significant increase in core body temperature.

Conclusion: Our results suggest that a dysregulated circadian system is associated with altered inflammatory responses in the heart and lung following IH exposure. Our study provides novel insight into the pathophysiological mechanisms associated with IH and potential biomarkers for the identification of comorbid cardiopulmonary pathology.

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0011

DAILY VERSES CIRCADIAN AMPLITUDE OF THE DISTAL-PROXIMAL SKIN TEMPERATURE GRADIENT

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Introduction: Sleep, circadian rhythms, and thermoregulatory physiology are highly integrated and impact each other. The daily

rhythm in the distal-proximal skin temperature gradient (DPG) is wider/more negative during wakefulness, and narrower/closer to zero during sleep. The circadian rhythm in the DPG is wider during the biological day and narrower during the biological night. Here we aimed to quantify and compare the amplitude of the daily rhythm in the DPG under wakefulness-sleep conditions versus the amplitude of the circadian rhythm in the DPG under sleep deprivation conditions to examine associations and magnitude differences.

Methods: Eleven [5 females] healthy adults [aged 27.6±10.2y, BMI 23.1±2.2 (mean±SD)] participated. After one week of at-home ambulatory monitoring with 8h per night sleep opportunities at habitual bedtimes, participants were studied in the laboratory for three days under controlled dim light (< 8 lux maximum) and ambient temperature conditions (22-24°C). Participants arrived in the afternoon, were kept awake 4h later than typical and scheduled to a 4h sleep opportunity. The next day, participants were sleep deprived for 28h followed by recovery sleep. Skin temperature was assessed every min with iButtons placed subclavicular (proximal skin temperature) and foot palmar (distal skin temperature). The DPG was calculated as difference between proximal and distal skin temperatures. A three-harmonic regression model was used to fit DPG data and derive daily and circadian rhythm amplitudes, and percent difference in amplitude was calculated. Pearson correlations were calculated between daily and circadian rhythm DPG amplitudes.

Results: DPG amplitude was significantly greater for daily versus circadian rhythm (p < 0.05). Percent difference analyses showed daily DPG rhythm was 57% larger than circadian DPG rhythm (SD 30%, range 22-134%). A significant correlation was found between daily and circadian rhythm DPG amplitudes (r = 0.71, p < 0.05).

Conclusion: The amplitudes of daily and circadian rhythms of the DPG are associated, but the daily rhythm amplitude is larger. Additional research is needed to compare the relative importance of daily versus circadian skin temperature amplitudes for sleep and circadian relevant outcomes.

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0012

NIGHT OWLS AND MORNING BIRDS FLY OVER THE GYM: CIRCADIAN MISALIGNMENT DOES NOT PREDICT PHYSICAL ACTIVITY IN ADOLESCENTS

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Introduction: Given that obesity rates have reached epidemic-level proportions in the U.S., it is more important than ever to identify preventative interventions to reduce obesity risk. Many aspects of sleep have been associated with obesity through their relationship to physical activity. Circadian misalignment is an area of sleep that is yet understudied but that may be especially relevant given the rapid biological and social changes in sleep timing seen in adolescence. This study examined the relationship between circadian misalignment and physical activity among adolescents.

Methods: Fifty adolescents completed an 11-day protocol that began with a baseline appointment where study staff measured participants' height and weight. Over the next 10 days,

participants wore waist accelerometers that measured physical activity and completed manual sleep diaries. After 10 days, participants completed a six-hour appointment in a dimly lit room (lux level < 5) where study staff collected saliva samples every 30 minutes to measure the onset of participants' melatonin levels. In this preliminary analysis, circadian misalignment was calculated by subtracting the timing of melatonin onset from the average bedtime noted in participants' sleep diaries; lower scores are reflective of greater circadian misalignment.

Results: Adolescents engaged in 12,038.77 minutes (SD=1737.62) of sedentary activity, 767.29 minutes (SD=260.93) of light physical activity, and 1,263 (SD= 411.89) of moderate-to-vigorous physical activity across this ten-day monitoring period. We conducted multiple regression analyses with circadian misalignment as a predictor of sedentary, light, and moderate-to-vigorous physical activity levels. Circadian misalignment was not a statistically significant predictor of sedentary physical activity ($p=.85$), light physical activity ($p=.70$), or moderate-to-vigorous physical activity ($p=.30$).

Conclusion: In our study, circadian misalignment did not predict sedentary, light, or moderate-to-vigorous physical activity levels. Current literature on other facets of sleep suggests that sleep duration and quality is related to physical activity. However, our results suggest that improving circadian alignment may not be a viable intervention to increase physical activity. Further studies are needed to validate these results as well as to explore the effects of circadian alignment on other aspects of obesity risk.

Support (if any):

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0013

REBELS WITHOUT A (SLEEP TIMING) CAUSE: CIRCADIAN MISALIGNMENT DOES NOT PREDICT RISKY BEHAVIOR IN ADOLESCENTS

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Introduction: Previous studies have shown that sleep impairments may contribute to a variety of problems in adolescents, including behavioral dysregulation. As current research explores the specific mechanisms behind sleep's influence on risk-taking behaviors, circadian misalignment may be particularly important to consider. Previous studies suggest that adolescents experiencing greater circadian misalignment are more likely to use illicit substances and to be involved in motor vehicle accidents. However, most studies on sleep and adolescent risk-taking only use self-report measures of sleep or focus on sleep duration. This study used gold-standard physiological methods to further examine the relationship between risk-taking behaviors and circadian misalignment in adolescents.

Methods: Fifty healthy adolescents (ages 14-18, 58% female; 94% white) came to the lab for a six-hour appointment in a dim-light room (lux < 5). Every 30 minutes, participants provided saliva samples to measure salivary dim-light melatonin onset (DLMO). Circadian misalignment was defined as the timing of melatonin onset subtracted from average bedtimes noted in participant sleep diaries completed on the previous 10 nights; higher estimates reflect lower circadian misalignment. During each DLMO appointment, participants also completed the Youth Risk Behavior Survey (YRBS) to evaluate levels of risk-taking behaviors

Results: We conducted multiple regression analyses to examine circadian misalignment as a predictor of risky car behavior, risky substance abuse, violence, suicide, and sexual behaviors. We hypothesized that circadian misalignment would be associated with higher levels of all risky behaviors. However, we found no significant relationship between circadian misalignment and risky car ($p=.712$), substance use ($p=.693$), violence ($p=.317$), suicide ($p=.259$), or sexual behaviors ($p=.427$).

Conclusion: While our results did not support our hypothesis that circadian misalignment is positively associated with risk-taking behaviors in youth, our use of gold-standard methods to assess circadian misalignment adds robustness to existing literature and raises questions over what aspects of sleep are most associated with previously identified increases in risk-taking behaviors. Future studies can utilize this methodology to further clarify the relationship between risky behaviors and circadian misalignment.

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0014

SLEEP DESERT = MORE DESSERT? CIRCADIAN MISALIGNMENT PREDICTS GREATER SUGAR CONSUMPTION IN ADOLESCENTS

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Introduction: As adolescent sleep duration and quality is declining, obesity rates are also increasing. Previous studies suggest a connection between sleep behaviors and obesity, with sleep's relationship with dietary intake emerging as a primary mechanism. Circadian misalignment may be particularly important to consider in this context due to its previously observed effects on reward processing and snack selection. This study examined the relationship between circadian misalignment and dietary intake among adolescents.

Methods: Fifty healthy adolescents (14-18, 58% female, 94% white) participated in an 11-day procedure. On day one, participants' height, weight, and Body Mass Index (BMI) were measured. For the next ten days, participants maintained a sleep diary and completed three 24-hour dietary recalls on randomized days. On the eleventh day, participants came to the lab for a six-hour appointment in a dim-light room (lux < 5). Every 30 minutes, participants provided saliva samples to measure dim-light melatonin onset (DLMO). To measure circadian misalignment, the timing of melatonin onset was subtracted from average bedtime noted in the sleep diaries; lower values suggest greater misalignment.

Results: We conducted multiple regression analyses to examine circadian misalignment as a predictor of average kcal, protein, fat, and sugar consumption. We hypothesized that circadian misalignment would be a positive predictor of greater kcal, fat, and sugar intake but a negative predictor of less protein intake. However, circadian phase did not significantly predict average kcal ($F(1,42) = 1.37$, $p = .25$, $R^2 = .03$, $\beta = -.18$, $b = -102.86$), fat ($F(1,42) = .001$, $p = .97$, $R^2 = .00$, $\beta = -.01$, $b = -.17$), or protein ($F(1,42) = .59$, $p = .45$, $R^2 = .01$, $\beta = -.12$, $b = -2.75$) consumption. Circadian misalignment did significantly predict average sugar intake, with greater misalignment predicting less sugar intake ($F(1,42) = 4.27$, $p = .04$, $R^2 = .09$, $\beta = -.30$, $b = -13.77$).

Conclusion: Although adolescents' circadian misalignment does not predict kcal, protein, or fat consumption, it does predict

sugar consumption. Adolescents whose sleep is not aligned with their intrinsic circadian rhythm may be at greater risk for consuming more sugar, which may ultimately increase obesity risk. These findings add to the literature on the potential relationship between sleep and obesity as moderated by dietary intake.

Support (if any):

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0015

A CIRCADIAN-INFORMED LIGHTING INTERVENTION MARKEDLY ACCELERATES CIRCADIAN ADJUSTMENT TO A NIGHT SHIFT-WORK SCHEDULE

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Introduction: Night shift-work results in misalignment between circadian timing and the sleep/wake schedule, negatively impacting sleep and performance. In encapsulated environments (e.g., submarines), the lack of strong daily solar lighting cues may impair circadian entrainment to the night shift-work schedule. This study designed and tested a circadian-informed lighting strategy to promote faster circadian phase delays to adjust to night shift-work compared to standard lighting.

Methods: Nineteen healthy sleepers (12 males/7 females, mean±SD aged 28.7±10.4 years) underwent two separate 8-day experimental conditions (circadian-informed lighting versus standard lighting). After a baseline sleep from 22:00 – 07:00 (day 1) and salivary dim light melatonin onset assessment ([DLMO], day 2), participants undertook simulated night shift-work (00:00 – 08:00) and slept during the day (10:00 – 19:00) for days 3–7 followed by a post-DLMO assessment on day 8. Ingestible capsules collected core body temperature (CBT) continuously throughout days 2–8, and cosine curve fitting was applied to estimate the timing of each daily temperature minima. The standard lighting condition mimicked current lighting on submarines (largely dim, blue-depleted light), while the circadian-informed lighting administered bright, blue-enriched and dim, blue-depleted lighting at times estimated to facilitate rapid circadian delay. The magnitude of daily CBT minima changes and the delay in pre- vs. post-DLMO were compared across conditions.

Results: There were significant day-by-condition interactions on CBT minima timing and DLMO timing (both $p < 0.001$). After 4 days of simulated night-shift work there was a mean [95%CI] 4.5 [3.4 to 5.7] hour greater delay in CBT minima and a 4.6 [3.6 to 5.6] hour greater delay in DLMO timing compared to standard lighting, equating to 3.6 and 2.4-fold faster delays in DLMO and CBT minima timing shifts, respectively.

Conclusion: Circadian-informed lighting substantially accelerates circadian re-adjustment to night shift-work. Lighting interventions could usefully improve sleep, performance, and safety in shift-workers.

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0016

INFLUENCE OF CIRCADIAN PREFERENCE ON SLEEP, DEPRESSION, AND ANXIETY IN CANADIAN STUDENT-ATHLETES

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Introduction: Student-athletes face unique demands that heighten vulnerability to both sleep and mental health problems. Circadian preference (CP) describes an individual's preferred timing for sleep and wake activity, with this conceived as a continuum between the extremes of morningness and eveningness. CP has been shown to influence both sleep and mental health, with greater eveningness preference generally associating with worse outcomes. However, these relationships are understudied in student-athletes. Thus, this investigation was designed to assess the influence of CP on sleep, depression, and anxiety in Canadian student-athletes.

Methods: Data were obtained throughout the academic semester from Canadian institutions, with student-athletes completing the Athlete Sleep Screening Questionnaire (ASSQ), General Anxiety Disorder-7 (GAD-7), and Patient Health Questionnaire (PHQ-9). ASSQ captured sleep health characteristics and CP, while GAD-7 and PHQ-9 assessed anxiety and depressive symptoms, respectively. ASSQ CP response options were Definitely-Morning, Morning, Evening, or Definitely-Evening as response options, and was coded on a 0–3 scale, with higher values representing increasing eveningness preference. Linear regression estimated associations of CP with sleep, depression, and anxiety. Adjusted regressions controlled for age, gender, race/ethnicity, and sport type.

Results: Sample included 559 Canadian student-athletes (Average Age = 18.9 ± 3.21 years; Percentage Women = 53%; Percentage White = 79.1%) from eight different sports. Regarding CP, 11.4% reported Definitely-Morning, 27.0% reported Morning, 41.8% reported Evening, and 19.8% reported Definitely-Evening. Greater eveningness preference significantly associated with worse overall sleep difficulties (padjusted < 0.0001), longer sleep latency (padjusted < 0.0001), reduced sleep satisfaction (padjusted < 0.0001), more prolonged sleep inertia (padjusted < 0.0001), more daytime naps (padjusted = 0.01), and more severe depressive symptomatology (padjusted = 0.0006).

Conclusion: Greater eveningness in a sample of Canadian student-athletes associated with worse sleep and psychological characteristics, including overall sleep difficulty, sleep latency, sleep satisfaction, sleep inertia, daytime napping, and depressive symptom severity. The results of this study provide compelling evidence that eveningness CP may predict poor mental and sleep health outcomes in student-athletes. Thus, further attention to circadian characteristics of student-athletes is warranted. Additionally, modifications to training schedules and team routines could be considered as preventative strategies for mental and sleep health problems.

Support (if any): Mitacs #IT23469

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0017

OBSTRUCTIVE SLEEP APNEA IS ASSOCIATED WITH ALTERED CIRCADIAN RHYTHMS IN SYSTOLIC BLOOD PRESSURE AT REST AND DURING EXERCISE.Saurabh Thosar¹, Nicole Bowles², Matthew Butler¹, Andrew McHill², Jonathan Emens¹, Steven Shea²¹ Oregon Health & Science University, ² Oregon Health and Science University

Introduction: Obstructive sleep apnea (OSA) is associated with an increased risk for major adverse cardiovascular events (MACE), such as sudden cardiac death. MACE is more frequent in the morning in the general population but more frequent in the middle of the night in people with OSA. Whether these differences are associated with changes in circadian rhythms of blood pressure regulation is unknown. We tested if circadian rhythms in systolic blood pressure (SBP) during rested wakefulness and in response to a standardized mild exercise are disturbed in people with OSA compared to healthy controls (HC).

Methods: We studied 39 participants (HC [n=25, age 52.8±7.8 {mean±SD} years], (OSA [n=14, 50.6±6.6 years]) during ten identical recurring 5-h 20-min behavioral cycles in dim light and in an environment free of time cues. SBP was measured in the supine position during rested wakefulness followed by while seated at rest and during mild-intensity (heart rate at 50% heart rate reserve using the Karvonen formula) exercise on a static cycle ergometer. Circadian phases were determined relative to the dim-light melatonin onset. We performed mixed-model cosinor analyses to test whether the groups differed in their SBP rhythms during rested wakefulness and in their BP responses to exercise.

Results: Melatonin levels or phases relative to clock time were not different between groups (p=0.17), suggesting similar timing of central circadian clock outputs. There was an overall rhythm (p<0.001) and a trend to group x circadian phase interaction for resting SBP (p=0.10). A separate group analysis showed a significant circadian rhythm in SBP in HC (p<0.001) with a peak in the evening but no evident circadian rhythm in people with OSA (p=0.17). There was no circadian phase x exercise reactivity interaction between groups, but overall, exercise reactivity of SBP was significantly higher in people with OSA (+4mmHg, p=0.001).

Conclusion: OSA is characterized by a blunted circadian rhythm in resting blood pressure and an exaggerated blood pressure reactivity to exercise. Mechanisms for these rhythm changes should be investigated further.

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0018

PERILS OF THE NIGHTTIME: IMPACT OF BEHAVIORAL TIMING AND PREFERENCE ON MENTAL AND PHYSICAL HEALTHJamie Zeitzer¹, Renske Lok¹, Lara Weed¹, Joseph Winer¹¹ Stanford University

Introduction: Both chronotype and the actual timing of sleep have been associated with mental and physical health outcomes.

While these often align, life often intervenes and causes a misalignment between desired and actual timing of sleep. The impact of such a misalignment has not been well investigated.

Methods: Community-dwelling (n=73,888) adults participating in the UK Biobank were monitored with wrist actigraphy for one week. Timing of behavioral patterns was derived from calculation of L5 (onset of lowest five hours of activity) and parsed into quartiles (Q1: early, Q2-3: intermediate, Q4: late). Chronotype was determined by a single question and parsed into quartiles (Q1: morning-type, Q2-3: intermediate, Q4: evening-type). Mental (mental, behavioral, and neurodevelopmental disorders, generalized anxiety disorder, depression) and physical (including metabolic disorder, diabetes, obesity, hypertension, circulatory disorder, digestive disorder, respiratory disorder, all-cause cancer) health status was determined with ICD-10 codes. Prevalence and likelihood (odds ratios) of disorders were calculated and adjusted for common demographic variables (sex, age, body mass index, material deprivation) and sleep duration.

Results: As compared to morning-type individuals who went to sleep early (aligned), morning-type individuals who went to sleep late (misaligned) had increased likelihood of both mental (OR=1.52±0.06, p<0.001) and physical (OR=1.45±0.03, p<0.001) health disorders. As compared to evening-type individuals who went to sleep late (aligned), evening-type individuals who went to sleep early (aligned) had decreased likelihood of both mental (OR=0.85±0.06, p=0.002) and physical (OR=0.66±0.03, p<0.001) health disorders.

Conclusion: Going to sleep early, irrespective of natural proclivity and potential circadian misalignment, is associated with better mental and physical health.

Support (if any): Mental Illness Research Education and Clinical Center, Department of Veterans Affairs

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0019

ASSESSING GENETIC VARIATION FOR EFFECTS OF LITHIUM ON CIRCADIAN CLOCK PERIOD AND MORTALITY IN FRUIT FLIESNoah Fryou¹, Mingjia Li¹, Bernard Possidente¹¹ Skidmore College

Introduction: Lithium is the treatment of choice for bipolar disorder, but the mechanism for its therapeutic effect remains unknown, and it has a low threshold for toxic side-effects. Bipolar disorder is cyclical disorder with periodic onsets of illness including depressive and manic episode that vary in cycle length among patients. One of lithium's well-documented effects- a lengthened circadian clock period- is intriguing since a circadian system abnormality is a potential explanation for the cyclical nature of bipolar disorder. Fruit flies are an efficient model organism for genetic analysis of circadian clock mechanisms, but few *Drosophila* studies have documented circadian effects of lithium, and none have examined genetic variation.

Methods: We used a random sample of 13 inbred strains from the *Drosophila* Genetic Resource Panel and three wild-type strains to examine genetic variation for the response of circadian clock period to 20mM LiCl, and its toxicity. Adults were assayed for circadian locomotor activity in constant dark using *Drosophila* Activity Monitors. Circadian clock period was estimated using chi-squared periodogram.

Results: Among 13 inbred strains examined there is no significant effect of lithium or genetic variation for effects of lithium

on circadian period, and only one inbred strain significantly lengthened circadian clock period in response to lithium. There was a significant sex difference in the response to lithium for circadian period, with an increase female and a slight decrease in males, and significant strain variation for sex-differences in circadian response to lithium. There are significant strain differences in mortality in response to lithium. All three wild-type strains significantly increased circadian period in response to lithium and varied in sensitivity to its toxicity.

Conclusion: Results to date suggest that the set of approximately 200 DGRP strains will be useful for investigating genetic variation for lithium toxicity and sex-differences for effects of lithium on circadian clock period. Circadian period in wild-type strains is more responsive to the period-lengthening effects of lithium, suggesting that genetic heterozygosity may play a role in the effects of lithium on circadian clock period.

Support (if any): Skidmore College Biology Department and Summer Collaborative Research Program.

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0020

ASSOCIATIONS BETWEEN BEDTIME AND WAKETIME VARIABILITY AND SLEEP OUTCOMES IN AUTISTIC CHILDREN

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Introduction: Up to 80% of autistic children experience sleep disturbances. Sleep hygiene guidelines advise patients to maintain consistent bedtimes and waketimes for the purpose of regulating one's circadian rhythm. However, the relationship between bedtime and waketime variability and sleep outcomes in autistic children is unclear, and so the current study examines these associations.

Methods: One hundred thirty autistic children (Mage = 8.81 yrs, SD = 1.92 yrs, range = 6-12 yrs, 71% male) completed two weeks of daily sleep diaries with parental assistance and concurrently wore actigraphic wrist watches (Actiwatch-2, Respironics). Rest intervals in Actiware software were set using visual inspection while referencing self-reported bed/waketime. Boundaries of rest intervals were defined as the time when the child first attempted sleep to the time when the child vacated bed. Subjective and objective estimates of bedtime, waketime, total wake time during attempted sleep periods, and total sleep time were obtained. Bayesian multi-level models obtained individual estimates of average variability in bedtime and waketime. Multiple linear regressions were then used to examine associations between subjective and objective bedtime and waketime variability and total wake time and total sleep time, controlling for age and average levels of bed/waketime variability. Models were separated out by subjective/objective sleep outcomes (i.e., subjective waketime variability predicting subjective total sleep time).

Results: Greater objective waketime variability was associated with less objective total sleep time ($B = -38.80$, $p < .001$, partial eta-squared = .071). Greater subjective waketime variability was associated with longer subjective total wake time ($B = 18.58$, $p = .02$, partial eta-squared = .058) and shorter subjective total sleep time ($B = -70.60$, $p < .001$, partial eta-squared = 0.227).

Conclusion: While results do not possess causal implications, greater subjective and objective waketime variability are associated

with poorer sleep outcomes in autistic children. Effect sizes ranged from approximately medium to large. Results suggest that bedtime variability may not be related to sleep outcomes in autistic children. Future studies should examine whether reductions in waketime variability mediate the effect of behavioral insomnia interventions on improved sleep in autistic children.

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0021

BIMODALITY PREVALENCE IN A SAMPLE OF UNDERGRADUATE STUDENTS IN SAO PAULO CITY

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Introduction: The concept of bimodality comprises a fourth circadian phenotype, the bimodal, whose identification is made by a re-scoring of the Morningness-Eveningness Questionnaire and was first described by Martynhak and colleagues in 2010. Bimodal subjects are originally classified as "intermediate" because they answer the questions sometimes as a morning person and, some others, as an evening one. The present work aimed to describe the prevalence of the bimodal chronotype in a sample of undergraduate students in Sao Paulo city.

Methods: A web-based cross-sectional study conducted between September 2018 and March 2021, with a convenience sampling method, composed by 615 undergraduate students (82% females, mean age: 23.4 ± 6.5 years) from two higher education institutions at Sao Paulo city.

Results: Forty-four students (7%) had positive bimodality indexes and bimodal individuals comprised 19 students (74% female; 26% male), 3% of the total sample.

Conclusion: We met our initial goal and found a bimodality prevalence of 3%. The description of bimodality prevalence in a sample of college students is interesting because they may be a maladaptive population from a sleep and rhythmicity point of view, which may be interesting for the design of academic public policies more consistent with the circadian preferences of students.

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0022

CHARACTERIZATION AND EVALUATION OF DIGITAL DIM LIGHT MELATONIN ONSET IN A POPULATION-BASED SAMPLE

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Introduction: Misalignment between circadian phase (i.e., timing) and the desired sleep window is associated with sleep

disturbances including insomnia and circadian rhythm sleep-wake disorders. Identifying circadian-driven sleep disruption requires assessment of circadian phase, the gold-standard of which is dim light melatonin onset (DLMO). While DLMO is traditionally measured in the lab using saliva or blood sampled over multiple hours, novel methods of estimating DLMO using activity and light data obtained from wearable sensors (i.e., digital DLMO) have been recently validated in samples with both healthy and disordered sleep. Such methods could potentially provide pragmatic, low-burden ways of assessing circadian phase, which in turn could be used to aid diagnostic decisions and to adjust circadian-targeted interventions in real time. However, digital DLMO has yet to be characterized within the broader adult population, which is needed to differentiate between normative and clinically salient values. Therefore, this study will examine digital DLMO in a large, population-based sample, as well as explore the potential clinical utility of digital biomarkers related to circadian phase.

Methods: This study will be a secondary analysis of data obtained during the ancillary sleep study of the Multi-Ethnic Study of Atherosclerosis (i.e., MESA Sleep). Seven days of activity and light data, measured via wrist-worn actigraphy, were obtained from 2,237 participants. Digital DLMO will be estimated using the extended Kronauer limit-cycle model of the human circadian pacemaker. Phase angles, or the differences in clock time, between digital DLMO and the following will be calculated: self-reported in-bed time; and sleep onset, midpoint, and offset measured by actigraphy. The associations between these phase angles and sleep outcomes (i.e., sleep onset latency, sleep efficiency, and sleep quality) will be explored using linear regression. Covariates will include the age, gender, and race/ethnicity of the participant. Weekend and weekday averages will be evaluated separately.

Results: Results will include the distribution of digital DLMO in a population-based sample, as well as the associations between digital DLMO phase angles and sleep outcomes.

Conclusion: This study will inform future research into the clinical potential of digital circadian biomarkers.

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0023

CIRCADIAN FRAGMENTATION AND STABILITY DISTINGUISH EMPLOYMENT STATUS

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Introduction: This analysis used data from the Assessing Daily Activity Patterns Through Occupational Transitions (ADAPT) study to compare differences in employment status on activity variability, as an indicator of circadian fragmentation and stability. Circadian fragmentation refers to frequency of alterations between rest and activity relative to the daily rhythm and stability refers to day-to-day similarity. High fragmentation and low stability have been linked to a number of negative health outcomes including depression, obesity, and heightened mortality risk.

Methods: The sample consisted of 155 participants that included 702 total cases (n = 434 employed, n = 268 unemployed) assessed

over 18 months. Participants were required to have involuntarily lost their jobs in the last 90 days. Employment status was determined for all participants at each visit based on demographic surveys. Daily activity patterns were assessed via actigraphy (Actiwatch-Spectrum) at 30 second epochs for 14 days. The non-parametric measures of intradaily variability (IV) and interdaily stability (IS) were used as measures of circadian fragmentation and stability. Several subsampling intervals were considered for IV, ranging from 5 minutes to 4 hours.

Results: Unemployment was associated with higher IV (for 1 hour subsampling intervals, $t=5.23$, $p < .001$) and lower IS than employment ($t=2.38$, $p < .05$). The same is true with changes in the subsampling interval for IV, with highest significance at 45 minutes to 1.5 hours. Significant findings remained even for 5 minute ($t=2.15$, $p < .05$) and 4 hour ($t = 4.07$, $p < .001$) intervals.

Conclusion: In a sample of adults with variable employment status, employment was associated with less circadian fragmentation and more stability than unemployment. These findings suggest that circadian fragmentation and instability may be two mechanisms by which job loss increases negative health risk. Future planned studies examining prospective changes in circadian fragmentation/stability during employment transitions will help answer this question.

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0024

DECREASED CIRCADIAN PERIOD ASSOCIATED WITH ENHANCED AUTOPHAGY IN CEREBLON KNOCKOUT MICE.

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Introduction: The circadian rhythm plays a critical role in many biological processes. Recently, autophagy was suggested as a regulating factor of circadian rhythm by reducing protein trafficking. Cereblon (CRBN) is a component of the E3 ubiquitin ligase complex for ubiquitination and degradation of the target proteins. Interestingly, cereblon ubiquitinates beclin 1, a potent autophagy inducer. Accordingly, the changes in cereblon are likely to affect the circadian rhythm. However, how cereblon can regulate circadian rhythm is not understood yet. Therefore, we hypothesized that cereblon might be an important regulator of the circadian rhythm and sought to investigate the relationship.

Methods: We obtained 3-month-old CRBN gene knockout (KO) and wild-type (WT) mice (n=4 and 8, respectively). The mice were housed in the wheel-based activity recording system under 12:12 light-dark (LD) condition for 1 week and constant darkness (DD) condition for the subsequent 2 weeks. Activity data were analyzed by ClockLab Analysis 6 (Actimetrics, USA). Autophagy-related proteins, including beclin1, microtubule-associated protein light chain-3 (LC3), and p63, were measured by the ELISA and western blot.

Results: We found that CRBN KO mice showed decreased circadian period during constant darkness (23.7 vs 23.4 hours, $p < 0.05$). The latency from the light-off time to initiating activities in the dark period was shorter in CRBN KO mice and WT mice. Protein analysis assay revealed that beclin1, LC3, and p62 increased in CRBN KO mice, indicating increased autophagy.

Conclusion: Our results demonstrated that CRBN knock-out mice showed shorter circadian periods and reduced autophagy-related molecules. We interpret that the lack of cereblon resulted in reduced degradation of beclin1 that triggers autophagy. As per Beesley et al (2020), autophagy-induced decrease in cytoplasmic congestion facilitates the protein trafficking for the crucial components of the molecular circadian clock. The shorter circadian period in CRBN KO mice was primarily due to the enhanced autophagy, although its implication in general health is unclear. Taken together, we suggest that CRBN is associated with circadian rhythm via controlling autophagy. Further investigations to understand how circadian amplitude was increased and the activity latency during the dark period was shortened are needed.

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0025

EFFECTS OF NLS-4 (LAUFLUMIDE) AND MODAFINIL IN A RAT MODEL OF CIRCADIAN RHYTHM AND CHRONIC SEVERE FATIGUE

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Introduction: The chronic fatigue syndrome (CFS) is a heterogeneous disorder characterized by easy fatigability, feverishness, diffuse pains, and depression. Many COVID-19 patients expressed a long-term effect of coronavirus (long-COVID), with some characteristics typically found in CFS. To examine the efficacy of NLS-4 (Lauflumide), in comparison with a positive control, modafinil, which has been shown to improve recovery from CFS in human, to improve recovery from severe fatigue in rats.

Methods: Male 7-8 weeks old Sprague-Dawley rats were subjected to a fatigue procedure for seven consecutive days. Their locomotor activity in home cage was then recorded for 3 days following the end of the fatigue procedure. A Sham group was subjected to the same measurement of circadian activity but without the fatigue procedure. Rats were divided into different groups which received, before the start of the dark period, three daily administrations of NLS-4, modafinil or vehicle (Control and Sham groups).

Results: The fatigue procedure induced an impairment in the circadian activity, that is a decrease in motor activity during the dark period and an increase in motor activity during the period of light. Accordingly, the difference of distance travelled between the dark period and the light period was lower in the Control group than in the Sham group. This impairment was still present 3 days after the end of the fatigue procedure. modafinil and NLS-4 dose-dependently increased locomotor activity during the dark phase and, to a lesser extent, during the light phase. The increase in activity during the dark phase was significant at doses of 16, 32 and 64 mg/kg with NLS-4 and at doses 64 and 128 mg/kg with modafinil but the effect of NLS-4 was more sustainable than that of modafinil.

Conclusion: This study suggests that the impairment of circadian rhythm induced by a fatigue procedure was reduced to a similar magnitude by modafinil (64 mg/kg) and NLS-4 (16 mg/kg). Since modafinil has been shown to improve recovery from

chronic fatigue in human, these results show that NLS-4 could improve recovery from CFS in human at doses four times lower than that used for modafinil.

Support (if any): NLS Pharmaceuticals

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0026

NOVEL HOME-BASED CIRCADIAN PHASE ASSESSMENT TOOL TO ENHANCE ACCESSIBLE QUALITY CARE OF CIRCADIAN RHYTHM DISORDERS- CIRCADIA STUDY

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Introduction: Circadian rhythm sleep-wake disorders (CRSWDs), shifted timing of physiology with the external environments. CRSWDs, often undiagnosed, can increase risk of cardiometabolic and psychiatric disorders, and may have substantial financial and social impacts. Dim light melatonin onset assay (DLMO), the current gold-standard diagnostic test for CRSWDs is expensive/difficult. We aim to develop a more accessible melatonin assessment.

Methods: Our DLMO assay kit is low-cost, home-based and self-administered. It contains all necessary components for a home-based DLMO assay, including 18 time-stamped saliva samples, a Philips Actiwatch, and a lux meter. We tested the feasibility of the kit across two DLMO assessments, one-week apart, in CRSWDs patients (N=5) and controls (N=5). We concurrently assessed sleep with wrist actigraphy and sleep diary over four weeks through a self-guided study website.

Results: We enrolled participants with delayed (n=4) and advanced (n=1) sleep disorder and 5 control participants (mean 38.2 y.o., SD 11.66 y.o.; biological sex: 9 female, 1 male (control)). Participants were 100% compliant completing questionnaires and sleep logging with little intervention and no in-person guidance. 5/10 participants completed 100% of sleep diary days. Average duration of study involvement, from consent to study completion, was 42.4 days. Participants successfully set up their collection space and collected saliva samples, remaining compliant to objectively-measured study protocols: 86.67% of samples were taken under sufficiently low light, and 82% were taken within five minutes of scheduled collection. We obtained and averaged two DLMO times for 7/10 participants (delayed sleep phase disorder (DSPD): 12:05 AM, controls: 9:56 PM). DLMO times were on average 3:18 hours earlier than self-reported sleep times.

Conclusion: Our pilot study, with both CRSWDs patients (N=5) and controls (N=5), found the at-home kits feasible and reproducible (5/6 participants had their DLMO times within an hour of each other). Using the kit, we confirmed their previous DSPD diagnoses and correctly classified controls through melatonin samples. We used objective measures (Actigraph) to verify the testing procedure was followed. These procedures will be tested on a larger scale in the Circadia Study (circadiastudy.org), set to launch in February 2023.

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0027

RAVAGED RAT RHYTHMS: CIRCADIAN RHYTHM INFLUENCE ON MECAMYLAMINE-INDUCED NICOTINE WITHDRAWALCristian Douglas Sales Garcia¹, Attaira Prince¹, Eric (E.J.) Schwartz¹¹ Grinnell College

Introduction: Mecamylamine (Mec) is a nicotinic acetylcholine receptor (nAChR) antagonist, serving as an important piece of nicotine addiction cessation therapies. When co-administered with nicotine, Mec blocks the positive reinforcing effects of the substance of abuse and may promote a lessened desire to perpetuate an addictive cycle. On the other hand, the magnitude of the withdrawal symptoms caused by this co-administration may reinforce addiction as users can choose to terminate the process of quitting.

Methods: The present study uses Sprague-Dawley rats to examine if the time of withdrawal onset in relation to circadian rhythms impacts the magnitude of the relevant aversive symptoms. We hypothesized that Mec injected during the rat's dark period show significantly less aversive symptoms when compared to when it's done during their light period. For this, we injected rats (n=3 per group) twice a day for thirteen days subcutaneously, with either saline or nicotine, a validated protocol to induce addiction. To measure aversive symptoms of nicotine precipitated withdrawal in light vs dark periods, we used a conditioned place aversion (CPA) behavioral assay in which the rats were either tested mid-light or mid-dark periods. In CPA, the rats were first introduced to the two distinct chambers and allowed to freely move in between them (day 10, for 15 minutes), while time spent in each one was analyzed. Then, they were conditioned to associate one chamber with saline and the other with Mec (days 11-12, for 30 minutes each). Finally, they were placed again in freedom, and the time spent in the mecamylamine-paired chamber was detracted from pre-conditioning to give us the results of aversion (day 13, for 15 minutes).

Results: We predicted that in the aftermath, the light-period rats on nicotine addiction schedule would show the shortest change in time in Mec-paired chamber, while saline-scheduled rats across both periods would show a change of zero—or no impact of Mec. Results indicated no significant differences between group averages for time spent in the Mec-paired chamber, but they showed saline-scheduled rats to be similarly aversive to it.

Conclusion: This result indicates the potential need for a study with a more selective nicotine blocker.

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0028

SYSTEMATIC REVIEW: TIME OF DAY DIFFERENCES IN COMPLETE BLOOD COUNT VALUESAnna Busza¹, Vani Sharma², Kendall Ferguson³, Andrea Fawcett⁴, Justin Knoll³, Phyllis Zee⁵, Anna Fishbein⁶¹ Feinberg School of Medicine, ² University of Illinois at Urbana Champaign, ³ Northwestern University, ⁴ Ann & Robert H. Lurie Children's Hospital, ⁵ Department of Neurology and Center for Circadian and Sleep Medicine, Northwestern University FeinbergSchool of Medicine, ⁶ Ann & Robert H. Lurie Children's Hospital Department of Allergy, Division of Pediatric Allergy & Immunology

Introduction: The complete blood count (CBC) is the most commonly ordered blood test with a large range of reference values that do not consider time of day for interpretation. Clinicians are largely unfamiliar with the influence of time of day on CBC values. Our objective was to systematically review this topic to report on peak and trough timing of CBC values.

Methods: A systematic search of PubMed, Ovid, Scopus, CINAHL, Cochrane, Embase, and Web of Science was performed for studies evaluating any part of the CBC over 24 hours. The studies were screened for eligibility based on predetermined criteria including: measurement of a part of the CBC with at least 3 time points in 24 hours. In total, 164 full-text articles were screened and 32 were included in the final analysis. The aggregated data was analyzed with the Cosinor package of R statistical environment and Stata SE to create cosinor graphs and Forest plots for each component of the CBC, respectively.

Results: Of the 32 articles, a metanalysis was performed on the following CBC subsets: leukocytes, erythrocytes, hemoglobin, hematocrit, platelets, neutrophils, lymphocytes, monocytes, eosinophils, and basophils. Lymphocytes exhibited a statistically significant diurnal rhythm (p=0.014, n=10 articles) with a peak of 2280.10 cells/uL at 23:17 (CI: 1731.80, 2828.40) and trough of 1661.49 cells/uL at 08:53 (CI: 1242.64, 2080.33). Erythrocytes, hemoglobin, and hematocrit peaked in the morning; while platelets, neutrophils, monocytes, and basophils peaked in the late afternoon and early evening; and lymphocytes and eosinophils peaked late at night. High heterogeneity in the results across studies was noted, likely attributable to the difference in circadian factors controlled. Limitations include the small sample size for each component of the CBC, the limited samples included in the meta analysis, and the significant heterogeneity affecting the results.

Conclusion: There are significant time of day changes in CBC values that might be important to consider as we move towards precision medicine. Given the limited number of studies with small sample sizes, future work should evaluate large data sources to inform time-dependent interpretation of the CBC.

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0029

THE EFFECT OF BMAL1 EXPRESSION ON AUTOPHAGY ACTIVITY IN ASTROCYTESConnor Campbell¹¹ University of Alabama at Birmingham

Introduction: Circadian rhythm disruption is an established symptom of neurodegenerative disease, however, there is mounting evidence that circadian systems drive early pathogenesis. The core circadian clock gene, BMAL1, mediates daily oscillations in transcription for homeostatic processes. Furthermore, the deletion of BMAL1 renders tissue transcriptionally arrhythmic and influences non-circadian genes, which causes reactive astrogliosis, oxidative stress, and neuronal injury in the brain. We have recently observed in-vitro that BMAL1 knockout astrocytes exhibit increases in the pH-sensitive lysosomal dye lysotracker. This suggests that the clock potentially modulates an even broader array of cellular processes, like autophagy, which maintains cellular homeostasis by delivering proteins to lysosomes

for degradation. Given that deficits in the clearance of stable protein aggregates is characteristic of many neurodegenerative disorders, the manipulation of autophagic machinery displays therapeutic potential. Therefore, the purpose of this project is to evaluate whether autophagy activity in astrocytes is regulated rhythmically by circadian clocks or through non-rhythmic genes linked to BMAL1 expression.

Methods: Through employing the fluorescent (RFP)-EGFP-LC3 reporter, we can detect differential organelle pH values to reveal the autophagy dynamics. Specifically, the RFP:EGFP signal ratio represents the progression from the autophagosome to the acidic autolysosome, thereby quantitatively illustrating the protein degradation arising from autophagy machinery.

Results: When comparing astrocyte-specific BMAL1 knockout mice to the wildtype littermates, there are significant increases for EGFP and RFP channels within the white matter. Furthermore, the greater RFP:EGFP value exhibits upregulated protein degradation, which validates that BMAL1 deletion can modulate autophagy activity. Upon establishing the baseline fluorescence for wildtypes across the 24-hour cycle, the EGFP and RFP signals suggested rhythmic activity for the light-stimulated groups. Nevertheless, the insignificant sinusoidal patterns among the dark-only counterparts reduces the probability that circadian clocks regulate autophagy activity.

Conclusion: The effect of BMAL1 deletion on autophagosomes in white matter tissue likely originates from other glial cell types that are uniquely susceptible to dysfunction in non-rhythmic pathways related to BMAL1 expression in astrocytes. Ultimately, investigating how BMAL1 protects against neurodegeneration will reveal therapeutic approaches for manipulating the autophagy machinery to promote pathology clearance, along with emphasizing the importance for maintaining sleeping patterns.

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0030

INSOMNIA IS ASSOCIATED WITH LOWER SERUM ANTIOXIDANTS IN THE HISPANIC COMMUNITY HEALTH STUDY/STUDY OF LATINOS

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Introduction: Insomnia is associated with neurodegenerative diseases. Concentration levels of some metabolites are associated with pathophysiologic changes, possibly in a sex-specific manner. Thus, serum metabolite levels are useful for understanding insomnia-related pathophysiological changes and how they potentially relate to neurodegenerative disease.

Methods: The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) is a longitudinal cohort study following self-reported Hispanic/Latino individuals in the U.S. At baseline, insomnia symptoms were captured using the Women Health Initiative Insomnia Rating Scale (WHIIRS), insomnia being defined as WHIIRS $\geq$ 9. Metabolites were measured using blood serum from the baseline exam in independent discovery and replication datasets. In discovery, metabolite associations with WHIIRS and with insomnia were estimated in linear regression. Significant associations (FDR p-values $<$ 0.05) were tested in the replication dataset and considered replicated if their p-value $<$ 0.05 and the direction of association matched with the discovery analysis. Associations were further studied for gender interaction. All analyses were adjusted for age, self-reported gender, study center, and Hispanic/Latino background.

Results: 3,895 individuals participated in the discovery analysis, and 2,121 in replication analysis. Female individuals were aged 46.5 on average (SD 15.1) and 35% had insomnia, while male individuals were aged 44.8 (14.8) and 24% had insomnia. After quality control, 767 metabolites were tested for association. Six metabolites were associated with WHIIRS (FDR $<$ 0.05) in the gender-combined analysis. Three were xenobiotics which were on the benzoate or salicylic acid metabolism pathway. Of the 6 metabolite associations, two replicated (p-value $<$ 0.05): hydrocinnamate and indolepropionate. These two metabolites had spearman correlation of 0.44. Higher levels of both metabolites were associated with lower WHIIRS, showing stronger associations in females (interaction p-value =0.04 for hydrocinnamate and p-value=0.13 for indolepropionate). Associations remained essentially unchanged in a model further adjusting for hypertension and diabetes. When removing 534 individuals who self-reported using sleeping pills at least once a week, the associations attenuated slightly: from an effect estimates of -0.0075 to -0.0069 (hydrocinnamate) and from -0.0082 to -0.0068 (indolepropionate).

Conclusion: Among the HCHS/SOL target population, insomnia symptom severity is associated with a lower concentrations of some plasma metabolite levels which are important antioxidant needed in preventing oxidative stress and neurodegeneration.

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0031

WHOLE GENOME SEQUENCE ANALYSES FOR EXCESSIVE DAYTIME SLEEPINESS IN THE NHLBI TOPMED PROGRAM

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Introduction: Excessive daytime sleepiness is associated with multiple sleep, cardiometabolic, and neuropsychiatric disorders. Previous genome-wide association studies (GWAS) of daytime sleepiness using a single question in European population revealed associations for multiple genes in central nervous pathways. However, findings are still limited and may not be generalizable to other populations. In this study, we performed the first whole-genome sequence (WGS) analyses for Epworth Sleepiness Scale (ESS) in the NHLBI Trans-Omics for Precision Medicine (TOPMed) program.

Methods: This study includes 15,201 individuals of diverse race and ethnic backgrounds from seven cohorts in the TOPMed. We performed GWAS of single common variants (MAF $>$ 0.01) and gene-based burden tests of low-frequency and rare functional variants (loss of function and missense; MAF $<$ 0.05). We adjusted for age, sex, body mass index (BMI), study, race/ethnicity, and genetic relatedness using linear mixed effects models implemented in the GENESIS R package.

Results: This sample included 43.8% males with a mean age of 54.9 years and BMI 29.6kg/m², of whom 21.3% were classified with excessive daytime sleepiness (ESS $\geq$ 10). In single variant test, we identified one novel genomic locus at rs60249969 (on CELF2) significantly associated with ESS (p-value=3.91x10⁻⁸). Suggestive significant associations were observed at 5 novel loci that overlapped with PDE7A/DNAJC5B, AHI1/PDE7B, KCNH7, F5, and FBXL17 (p $<$ 1x10⁻⁷). In gene-based burden test, we did not identify any gene significantly associated with the ESS after correcting for multiple comparisons (p $<$ 2x10⁻⁶). Suggestive significant evidence was observed at OR1A2 (consisting of 41 missense variants; p-value=1.65x10⁻⁵), an olfactory receptor gene differentially expressed in choroid plexus in the brain implicated in neurodegenerative diseases.

Conclusion: In our investigation of common and rare variant associations with excessive daytime sleepiness as assessed by the ESS, we identified one significant and several suggestive novel loci that mapped to genes highly expressed in brain tissues, which may have implications on sleep wake control system. Our next step will include replication analyses using independent imputed samples.

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0032

ADA FUNCTIONAL POLYMORPHISM MODULATES REM SLEEP FOLLOWING TOTAL SLEEP DEPRIVATION

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Introduction: Adenosine Deaminase (ADA) regulates extracellular levels of adenosine, a brain correlate of sleep homeostasis. A single nucleotide polymorphism (SNP) of the ADA gene (rs73598374) is known to be associated with increased homeostatic pressure for NREM sleep after total sleep deprivation (TSD). Whether this genotype effect also impacts REM sleep after TSD has not been systematically investigated. The limit cycle reciprocal interaction model posits that NREM/REM cycles are regulated by cholinergic and GABAergic neurotransmitter systems. While NREM/REM regulation is also thought to be mediated by sleep homeostatic state, evidence of an association with adenosine levels has not been reported. Here we investigate the influence of ADA on REM sleep at baseline and following TSD.

Methods: N=48 healthy, normal sleepers (ages 27.7 ± 5.3, 23 females) participated in one of three in-laboratory TSD studies. Following 10h baseline sleep (22:00–08:00), participants underwent 38h TSD, with subsequent 10h recovery sleep (22:00–08:00). Sleep periods were recorded polysomnographically and scored visually according to AASM criteria. Genomic DNA was extracted from whole blood, and the ADA SNP was assayed using real-time PCR. Sleep stages were analyzed using mixed-effect ANOVA with fixed effects of ADA genotype, night (baseline vs. recovery), and their interaction, controlling for study, with a random effect over subject on the intercept.

Results: The frequency of genotypes (G/G: 42, A/G: 6) did not vary from Hardy-Weinberg equilibrium. There was no genotype effect on total sleep time and no genotype by night interaction ($p > 0.7$). However, A allele carriers spent more time in REM during baseline and less during recovery compared to G/G homozygotes (genotype by night interaction: $F[1,46]=8.13$, $p=0.007$). Conversely, while not statistically significant ($p > 0.1$), A allele carriers spent less time in NREM during baseline and more during recovery compared to G/G homozygotes.

Conclusion: ADA genotype was associated with a shift in balance between REM and NREM at baseline, as well as changes therein after TSD, without concomitant effect on total sleep time. This suggests a role for adenosine in mediating REM sleep regulation, possibly through a sleep homeostatic effect on the reciprocal interaction between NREM and REM.

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0033

GENOME-WIDE ASSOCIATION ANALYSIS OF COMPOSITE SLEEP SCORES IN 413,904 INDIVIDUALS

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Introduction: Recent genome-wide association studies (GWAS) of individual sleep traits have identified hundreds of genetic loci, often implicating genes and biological pathways that are shared across sleep phenotypes. Modeling multiple dimensions of sleep may allow identification of common underlying genetic mechanisms and complement analyses of individual traits. Moreover, construction of novel sleep health scores, accounting for correlations between traits, has the potential to enhance specificity and power for genetic analyses.

Methods: We performed GWAS of composite sleep scores derived from five sleep questions characterizing 413,904 individuals of European ancestry from the UK Biobank. We constructed an additive sleep score (SS-add) as a sum of up to five favorable self-reported sleep behaviors (sleep duration of 7-8 hours, early chronotype, few insomnia symptoms, no snoring, and no excessive daytime sleepiness) as well as five principal component scores (SS-PC1 – SS-PC5) using the underlying sleep traits. SNP-level association studies of the sleep scores were complemented with multiple follow-up analyses, including investigation of pathway, tissue, and cell-type enrichments, as well as comprehensive genetic correlation (381 representative phenotypes) and bi-directional Mendelian randomization (MR) analyses (40 selected phenotypes).

Results: Sleep scores SS-PC1 (interpretable as longer duration sleep without insomnia symptoms) and SS-PC2 (healthy sleep without snoring or sleepiness) showed higher heritability (respectively 11.7% and 9.3%) compared with their primary underlying traits. SS-PC3 (loading strongly on chronotype) showed highest overall heritability (15.3%). Accounting for the six GWAS, we identified 28 significant novel loci ($p < 8.3 \times 10^{-9}$), 31 additional novel loci ($p < 5 \times 10^{-8}$), and 341 loci previously reported ($p < 5 \times 10^{-8}$) by GWAS of individual sleep traits. Associated loci mapped to genes enriched in expression in brain tissues, and in metabolic and neuronal pathways. Numerous neurological, cardiometabolic and other traits were genetically correlated with sleep health (104 with $|\rho_{\text{ho\_gl}}| > 0.3$, $p < 2 \times 10^{-5}$). MR associations ($p < 2 \times 10^{-4}$) pointed to causes (BMI [SS-PC2/PC4], smoking [SS-add/PC1], lower socio-economic status [SS-add/PC5]) and consequences (coronary heart disease [SS-add/PC1], pain [SS-PC1/5]) of poor sleep.

Conclusion: Composite sleep health scores revealed novel genetic mechanisms of related sleep behaviors, helped clarify relationships with neurological and cardiometabolic traits, and deserve further investigation.

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0034

GENETIC VARIANTS FOR OBSTRUCTIVE SLEEP APNEA IDENTIFIED AFTER MODELING INTERACTIONS WITH DAYTIME SLEEPINESS

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Introduction: Obstructive sleep apnea (OSA) is a complex sleep disorder that presents with a range of symptoms, including excessive daytime sleepiness (EDS), postulated to represent a more severe subtype. Despite significant heritability and past GWASs, genetic mechanisms of the disorder remain unclear. Given that EDS often reflects chronic sleep insufficiency and a pro-inflammatory state, we reasoned it may interact with genetic variants to modify risk for OSA. We tested this hypothesis by investigating gene by sleepiness interaction analysis of OSA.

Methods: Whole-genome sequencing data of 11,619 individuals of diverse race and ethnic backgrounds from the NHLBI Trans-Omics for Precision Medicine program was used, with the outcome being Apnea-Hypopnea Index (AHI) and the exposure Epworth Sleepiness Scale (>10: EDS, ≤10: non-EDS). GENESIS R package was used to perform 2-stage rank normalization, adjusting for age, sex, BMI, ancestral PCs, cohort, and genetic relatedness, and rescaling residuals to a unit variance, separately in each study/ancestry group. GEM software was used to perform gene-EDS interaction analyses, including 1 df tests of marginal SNP effect and interaction effect of SNP×EDS on AHI, respectively, and 2 df test of joint significance of both. Robust standard errors were used, with a significance threshold of $p < 5 \times 10^{-8}$.

Results: The 1 df test of marginal SNP effect identified one novel locus (rs35370454) that mapped to IFRD1, whose overexpression has been associated with sleep restriction, and hypomethylation with narcolepsy. The 1 df test of interaction effect identified two novel loci (rs13118183, rs281851) that mapped to genes MARCHF1 and CCDC3. The 2 df joint test did not reveal additional novel loci. CCDC3 has shown to repress inflammatory activity of TNF- α , a cytokine postulated to be involved in sleep regulation. MARCHF1 has shown to inhibit cellular insulin sensitivity as well as promote NF- κ B, with degree of activation positively correlating with OSA severity.

Conclusion: By modeling the modification effect of EDS on OSA we identified 3 novel loci. This approach may be useful in understanding the genetic factors that vary across OSA subtypes. For next steps, we seek to conduct replication analysis using independent imputed samples.

Support (if any): NHLBI, R01HL153814 (H.W.), R35HL135818 (S.R.).

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0035

MELANOPSPIN GENETIC VARIANTS AND DELAYED SLEEP PHENOTYPE – WHOLE GENOME SEQUENCING ANALYSIS

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Introduction: Melanopsin (OPN4) is a blue light-sensitive opsin-type G-protein coupled receptor. It is highly expressed in photo-sensitive retinal ganglion cells which mediate responses to light, including regulation of sleep, circadian photoentrainment, and pupillary light response. Mutations in OPN4 were shown to affect responses to light, ultimately affecting the regulation of circadian rhythms and sleep. Previously, we describe a male carrier of the OPN4 missense variant diagnosed with delayed sleep-wake phase disorder (DSWPD), with a consistent recurrent pattern of delayed sleep onset. The rs143641898 [NM_033282.4:c.502C>T

p.(Arg168Cys)] variant in the OPN4 gene that was shown in a functional study to render the OPN4 protein non-functional.

Methods: The analysis was conducted on whole genome sequencing samples obtained from patients with a clinical diagnosis of DSWPD. Age and sex-matched samples were used as controls.

Results: Here we report an enrichment of OPN4 rare coding variants, $MAF < 1$, in a set of 117 DSWPD samples as compared to 315 healthy controls. This significant enrichment likely implies that other rare pLOFs can similarly contribute to the delayed sleep phenotype. Moreover, we report a significant association of rs1079610, a common variant in OPN4 – with delayed bedtime in DSWPD patients. This variant has been previously reported in association with altered pupillary responses. This effect is not seen in a large set of healthy controls without DSWPD diagnosis.

Conclusion: The OPN4 discussed rare OPN4 variants likely increase the risk of DSWPD via its direct effect on the pathophysiology along the melanopsin axis. This study offers useful insights for the differential diagnosis and ultimately treatment of DSWPD risk in which patients carry pathogenic variants in the OPN4 gene.

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0036

ARC GENOTYPE MODULATES REM EEG SPECTRAL POWER FOLLOWING TOTAL SLEEP DEPRIVATION

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Introduction: EEG spectral power in the alpha range is indicative of a wake-like state, with alpha power typically high during wakefulness and reduced during sleep. We previously reported that a single nucleotide polymorphism (SNP) of the activity-regulated cytoskeleton associated protein (ARC) gene modulates non-REM theta and alpha spectral power. Here we sought to determine whether ARC genotype is also associated with phenotypic differences in EEG spectral power during REM sleep.

Methods: 43 healthy adults (27.6 ± 4.8 y; 23 females) participated in one of two in-laboratory studies. Each participant had a 10h baseline sleep opportunity (22:00–08:00), 38h TSD, and 10h recovery sleep opportunity (22:00–08:00). Sleep periods were recorded polysomnographically and visually scored according to AASM criteria. Genomic DNA was assayed for the ARC c.*742 + 58C>T non-coding SNP, rs35900184. Log-transformed EEG spectral power (C3-M3 derivation) for REM sleep over 0.2 Hz frequency bins in each of four frequency bands – delta (0.8–4.0 Hz), theta (4.2–8.0 Hz), alpha (8.2–12.0 Hz), and beta (12.2–16.0 Hz) – was analyzed by band using mixed-effects ANOVA with fixed effects for ARC genotype, night (baseline, recovery), frequency bin, and their interactions. Analyses included study and age as covariates and a random effect over subjects on the intercept.

Results: The genotype distribution in this sample was 28 C/C homozygotes, 10 C/T heterozygotes, and 5 T/T homozygotes. There was a significant genotype by night interaction in the alpha band ($F_{2,1560} = 23.80$, $p < 0.001$). Compared to baseline sleep, T/T homozygotes had 13.0% more alpha power during post-TSD recovery sleep, whereas C/C homozygotes had 1.2% less alpha power and C/T heterozygotes had 3.2% less alpha power. This differential TSD effect for the ARC genotypes was not seen in the other spectral bands.

Conclusion: Our results show that ARC genotype mediates the REM sleep EEG response to TSD, with T/T homozygotes displaying a pronounced increase in REM alpha power following sleep deprivation. The ARC SNP has been associated with schizophrenia, a psychiatric disorder with known sleep disturbances. As such, the ARC-mediated increase in REM EEG alpha power for T/T homozygotes might be a marker of a psychosis-like predisposition.

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0037

WITHDRAWN

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0038

GENIOGLOSSUS MUSCLE (GG) ACTIVITY EVOKED BY PHARMACOLOGICAL STIMULATION OF ALPHA1-ADRENOCEPTORS IN PRE-HYPOGLOSSAL REGION (PHR)Leonardo Frasson Reis¹, Kelly Xu², Irma Rukhadze³, Victor Fenik⁴¹ Albany Medical College, ² Albany Medical Center, ³ Albany Medical College, Albany Med Health System, ⁴ Albany Medical Center, Albany, NY

Introduction: The sleep-related withdrawal of noradrenergic excitation and increased cholinergic inhibition of hypoglossal motoneurons (HM), which control the tone of the GG, the largest protruder muscle of the tongue, play a critical role in obstructive sleep apnea pathophysiology. In an animal model of REM sleep, antagonism of alpha1 noradrenergic signaling by microinjections of prazosin into the hypoglossal nucleus (HN) strongly decreased hypoglossal nerve activity. However, a significant delay of this decrease prompted a hypothesis that prazosin must diffuse outside the HN to block alpha1-adrenoceptors that are located on interneurons, which mediate noradrenergic drive to HM. Here, we aimed to map the PHR by microinjecting alpha1 drugs for possible location of these interneurons.

Methods: Adult C57bl/6J mice (n=28) of both sexes were anesthetized with either ketamine/xylazine (120/20 mg/kg, i.p.) or 1.5-2.0% isoflurane inhaled through a nose mask. Electromyogram electrodes were implanted into GG and diaphragm to record their activity. We microinjected phenylephrine (alpha1-adrenoceptor agonist, 5-10 nl, 1 mM) in both ketamine/xylazine- and isoflurane-anesthetized mice, while prazosin (10 nl, 0.2 mM) was injected only in mice under isoflurane anesthesia. The injection sites were marked with Pontamine Sky Blue. After the completion of experiments, all animals were perfused, and brains removed for histological analysis.

Results: The activity of GG showed spontaneous phasic inspiratory modulation with minimal tonic component under both anesthesia conditions although its amplitude was markedly larger in animals anesthetized by isoflurane. Effective microinjections of phenylephrine elicited short-lasting (approximately 15 minutes) excitatory GG responses. When injected into the HN, phenylephrine strongly excited GG as compared to injections to the PHR in ketamine/xylazine-anesthetized mice. However, in isoflurane-anesthetized animals, microinjections of phenylephrine into the PHR induced greater activation of GG than injections onto the HN. Microinjections of prazosin in isoflurane-anesthetized mice produced long-lasting disfacilitation of GG activity. However, prazosin injections into the PHR elicited responses with the shortest latencies (0-120 s).

Conclusion: These results suggest that the putative interneurons that mediate noradrenergic drive to HM are located in the PHR. This finding is important for deciphering the neuronal network that controls the state-dependent activity of GG, which may provide new therapeutic targets for OSA treatment.

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0039

INVESTIGATING THE ROLE OF STRIATAL DOPAMINE IN SLEEP AND NARCOLEPSY-CATAPLEXYBrandon Toth¹, Christian Burgess¹, Katie Chang¹¹ University of Michigan

Introduction: Dopamine release in the striatum is known to govern reward, motor, and sleep behaviors. There also exists a link between pharmacological manipulation of dopamine receptors and cataplexy occurrence, yet the precise spatial and temporal dynamics of dopamine release in relation to cataplexy onset are not understood. In the present study, we evaluate dopamine release dynamics in orexin knockout (OX KO) mice during cataplexy and physiological behaviors.

Methods: OX KO mice were implanted with EEG/EMG electrodes, and dLight1.1 was expressed in the nucleus accumbens core (NAcc), shell (NAcSh), and dorsolateral striatum (DLS) to perform in vivo fiber photometry of dopamine release in freely-moving animals. In NAcc and NAcSh mice, ChrimsonR was retrogradely expressed in the ventral tegmental area (VTA), to allow for precise optogenetic control of midbrain dopamine projections to different regions of the striatum. We also expressed dLight1.1 in the NAcc of wildtype (WT) mice as a control. Three different stimulation parameters were used in independent recordings: phasic 20 Hz stimulation, phasic 10-40 Hz variable stimulation, and tonic 2 Hz stimulation.

Results: First, we show that while dopamine release in response to rewarding behaviors is muted in OX KO animals, there is no difference in dopamine release across sleep state transitions between OX KO and WT animals. Second, we demonstrate that there is a striking increase in dopamine release in both the NAcc and NAcSh, but not in the DLS, at the onset of cataplexy. This increase occurs independently of the behaviors that the animals were engaged in immediately prior to cataplexy, suggesting that the increase is characteristic of all cataplexy episodes. Finally, we find that while high frequency phasic stimulation did not affect cataplexy frequency, low frequency, tonic stimulation reduced both cataplexy and REM occurrence.

Conclusion: We show that there are differences in dopamine release in response to rewarding events, but not changes in sleep states, in OX KO and WT animals. We also identify dopamine release in the ventral striatum as a key node in cataplexy regulation, which helps to further our understanding of the limbic circuitry that underlies narcolepsy symptoms.

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0040

LEPTIN SIGNALING IN THE DORSOMEDIAL HYPOTHALAMUS COUPLES METABOLISM AND BREATHING IN OBESITYMateus Amorim¹, Xin Wang², O Aung¹, Shannon Bevans-Fonti¹, Frederick Anokye-Danso¹, Joan Escobar², Carla Freire¹

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Introduction: Individuals with obesity hypoventilation syndrome (OHS) are unable to increase ventilation to match increased CO₂ production (VCO₂). Obstructive sleep apnea (OSA), defined by the closure of the upper airway during sleep, is present in 90% of OHS patients. Leptin, an adipocyte-produced hormone, acts in leptin receptor (LEPRb) positive neurons and was implicated in the pathophysiology of OSA and OHS. Diet-induced obese (DIO) C57BL/6J mice shows features of OHS and OSA. Leptin-mediated neural pathways may link metabolism and breathing in obesity. We hypothesized that LEPRb-positive neurons in the dorsomedial hypothalamus (DMH) are necessary and sufficient to match control of breathing to VCO₂ and that the stimulation of these neurons relieves OHS in DIO mice.

Methods: We expressed designer receptors exclusively activated by designer drugs (DREADDs) in DMH of DIO Leprb-Cre mice and measured breathing during sleep, the hypercapnic ventilatory response (HCVR), VCO₂, and O₂ consumption (VO₂).

Results: Activation of LEPRb-positive DMH neurons increased inspiratory flow and minute ventilation during REM sleep, without affecting sleep architecture. The effect was pronounced during inspiratory flow limitation, suggesting that upper airway obstruction during REM sleep was relieved. Activation of these neurons increased the HCVR and this response was blunted by a serotonin receptor antagonist, methysergide. Activation of these neurons augmented VCO₂, VO₂, and VE/VCO₂, suggesting that breathing was stimulated out of proportion to increases in metabolism. In vitro experiments revealed that LEPRb-positive DMH neurons project to 5-HT neurons in the dorsal raphe (DR) and that optogenetic stimulation of these neurons evoked excitatory postsynaptic currents in 5-HT neurons of the DR. Administration of retrograde Cre-dependent AAV harboring caspase to the DR in Leprb-Cre mice deleted LEPRb-positive DMH neurons and abolished respiratory and metabolic effects of chemogenetic stimulation. Apoptosis of LEPRb-positive DMH neurons projecting to the DR also prevented the increase in ventilation during REM sleep induced by intranasal leptin.

Conclusion: Leptin increases the HCVR, improves upper airway patency during sleep, and increases VCO₂ acting on LEPRb-positive DMH neurons projecting to the DR. We conclude that LEPRb-positive DMH neurons projecting to the DR couple metabolism and breathing in obesity.

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0041

NEURONAL CIRCUITS CONVERGENTLY DISRUPTED IN THE GENETIC BASIS OF SLEEP PHENOTYPES AND RARE NEURODEVELOPMENTAL SYNDROMES

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Introduction: Sleep-related phenotypes have been frequently reported in early on-set epileptic encephalopathies (EE) and in developmental delay (DD) syndromes, in particular in syndromes related to autism spectrum disorder (ASD). Yet the convergent pathogenetic mechanisms between these comorbidities are largely unknown.

Methods: We first performed a gene enrichment study that identified shared risk genes among rare EE/neurodevelopmental disorders (NDD), rare DD genetic syndromes and sleep disturbances. We then determined cellular and molecular pathways enriched among genes shared between sleep phenotypes and those two early onset mental illnesses, aiming to identify genetic disparities and commonalities among these phenotypic groups.

Results: The sleep gene set was observed as significantly overlapped with the two gene lists associated to rare genetic syndromes (i.e. EE/NDD and DD gene sets), suggesting shared genetic contribution. Similarities across significantly enriched pathways between the two intersect lists comprehended mostly synapse-related pathways, such as retrograde endocannabinoid signaling, serotonergic and GABAergic synapse. Network analysis indicates EE/NDD vs sleep specific clusters and DD vs sleep specific clusters related to synaptic and transcriptional regulation, respectively. Longstanding functional patterns previously described in EE and NDD genetic architecture were recaptured after dissecting the overlap between the genes associated to those developmental phenotypes and sleep disturbances, suggesting that during neurodevelopment different molecular and functional mechanisms are related to alterations on circadian rhythm.

Conclusion: The overlapping gene set and biological pathways highlighted by this study may serve as a primer for new functional investigations of shared molecular mechanisms between sleep disturbances and rare developmental syndromes, with or without epilepsy.

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0042

EEP-PROMOTING GABAERGIC NEURONS IN THE PARAFACIAL ZONE PLAY A ROLE IN ANESTHETIC-INDUCED UNCONSCIOUSNESS IN MICE

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Introduction: Although the precise mechanisms by which anesthetics induce unconsciousness are unknown, there is evidence that shared brain circuits are engaged during sleep and general anesthesia. The parafacial zone (PZ) of the brainstem has recently been identified as a sleep-promoting region. Specifically, GABAergic neurons in the PZ (PZ-GABA) are active during non-REM sleep. The role of sleep-promoting PZ-GABA during anesthetic-induced

hypnosis is unknown. We hypothesized that PZ-GABA are active during general anesthesia and contribute to anesthetic-induced hypnosis.

Methods: Adult C57BL6 mice ($n = 3$) were subjected to two-hour exposures of a hypnotic dose of an inhaled general anesthetic (isoflurane 1.2%) in oxygen, a non-immobilizer, F6, that lacks hypnotic properties (1,2-dichlorohexafluorocyclobutane 3%) in oxygen, or oxygen alone. The brains were harvested immediately following these exposures. The sections of brain were immunostained for c-Fos and GAD. To study the role of PZ-GABA in isoflurane-induced hypnosis, ablation of PZ-GABA was performed in adult bitransgenic Vgat-ires-Cre;Ai6 mice in which GABAergic neurons express a fluorescent reporter ($n = 5$ per group). Anesthesia sensitivity was evaluated weekly for four weeks after the virus injections by assessing the presence of a righting reflex during the exposures.

Results: In the PZ, a hypnotic dose of Isoflurane selectively activated GAD-positive GABAergic neurons compared to mice treated with F6 and oxygen. ($P < 0.01$ for both F6 and oxygen vs. Isoflurane, one-way ANOVA) Furthermore, mice lacking PZ-GABA demonstrated resistance to anesthetic induction, decreased sensitivity during the maintenance phase, and consistently increased the propensity to emerge from anesthesia. (For both induction and emergence, the upper 95% CI of EC50 at baseline was lower than the lower 95% CI at all time points after the injections. For maintenance phase, $P < 0.05$ for baseline vs. 1-week, one-way ANOVA)

Conclusion: PZ-GABA was active during isoflurane exposure. Moreover, the absence of PZ-GABA resulted in resistance to isoflurane-induced hypnosis. These findings suggest that PZ-GABA, a sleep-promoting region in the brainstem, plays an important role in general anesthesia.

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0043

MODULATION OF ULTRA-SLOW CALCIUM OSCILLATION IN THE DENTATE GYRUS DURING NON-REM SLEEP

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Introduction: The function of sleep in memory consolidation has been well established. Hippocampal CA1 and CA3 subregions are thought to be particularly important in this process. The current working hypothesis postulates that episodic memory traces captured during waking hours are replayed in the hippocampal CA1-CA3 areas and transferred to the cortex for long-term storage during sleep. Even though the sensory and spatial information from higher-order cortical areas such as the entorhinal cortex primarily enters the hippocampus via the dentate gyrus (DG), this structure has always been considered as the “silent partner” in memory consolidation. Whether and how the captured memory traces are transferred from the DG toward the downstream hippocampal areas is less known.

Methods: Here, we used fiber photometry, two-photon calcium imaging, and EEG recording to examine the activity of DG during sleep.

Results: Strikingly, we found that DG cells are even more active during sleep than wakefulness and the calcium activity in the DG slowly oscillates during non-REM (NREM) sleep epochs.

Furthermore, we also found that the cycles of this activity coinciding with microarousals are tightly locked to brief serotonin (5-HT) release during NREM sleep. Pharmacological blockade of 5-HT1a receptors abolished the calcium oscillations in the DG. Furthermore, genetic knockdown of 5-HT1a receptors in the DG leads to memory impairment in spatial and contextual memory tasks.

Conclusion: Together, our results indicate that ultra-slow calcium oscillations in the DG during NREM sleep are driven by serotonin fluctuations and they are required for memory consolidation.

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0044

THALAMOCORTICAL FUNCTIONAL CONNECTIVITY INCREASES DURING REM SLEEP SAWTOOTH WAVES

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Introduction: Whereas sawtooth waves have been described as phasic bursts of slow oscillations in the scalp EEG during rapid-eye-movement (REM) sleep sixty years ago, little is known about their generators and functional role. Stereo-electroencephalography recordings (SEEG) performed for pre-surgical evaluation in drug-resistant focal epilepsy have allowed to demonstrate a peculiar slow activity in the thalamic medial pulvinar nucleus during REM sleep, contrasting with the fast desynchronized cortical activity. However, the link between this slow thalamic activity and sawtooth waves remains unexplored. Here, we used combined polysomnography and SEEG to investigate the dynamics of thalamic activity and thalamocortical functional connectivity at the time of scalp EEG sawtooth waves.

Methods: Night sleep recordings from six patients investigated with SEEG including thalamic recording in the Epilepsy Department of Lyon University Hospital were analyzed. Sawtooth waves were visually detected in the scalp EEG and compared with control segments selected in REM sleep. Thalamic SEEG and cortical EEG spectral power as well as thalamo-cortical functional connectivity assessed by the phase locking value were compared between sawtooth waves and control segments using paired t-tests. The effect size was assessed with Cohen's d.

Results: A significant increase in the delta-theta (2-5 Hz, $p < 0.003$, $d = 0.31$) and gamma (30-100 Hz, $p < 0.003$, $d = 0.31$) power bands was found in posterior nuclei of the thalamus at the time of scalp-detected sawtooth waves. Functional thalamocortical connectivity in the 2-5 Hz band was enhanced during sawtooth waves as compared to control segments, with the thalamus driving the cortex ($p < 0.001$; $d = 0.84$, average $\pm$ SD time lag: 23 $\pm$ 22 ms).

Conclusion: Our results provide evidence that sawtooth waves involve not only cortical areas but also the thalamus, suggesting a relation with ponto-geniculo-occipital waves. They may hence represent phasic brainstem-triggered short windows of an increased thalamocortical dialogue during REM sleep.

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0045

CHARACTERIZATION OF A NOVEL NARCOLEPSY MOUSE MODEL WITH CONDITIONAL ABLATION OF THE OREXIN NEURONS

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Introduction: Narcolepsy type 1 (NT1) is caused by selective loss of orexinergic neurons. Although narcolepsy typically begins in childhood or adolescence, most mouse models induce loss of the orexin peptides or orexin neurons from birth. To generate a mouse model that reflects the acquired loss of orexinergic neurons in human NT1, we produced recombinant mice expressing the human diphtheria toxin receptor (DTR) driven by the prepro-orexin promoter (orexinDTR mice). We examined whether administration of diphtheria toxin (DTX) to orexinDTR mice caused selective loss of orexinergic neurons and induced narcolepsy symptoms such as sleep-wake fragmentation and cataplexy. In addition, we investigated the effects of an orexin 2 receptor (OX2R)-selective agonist OX-201 on narcolepsy symptoms in DTX-treated orexinDTR mice.

Methods: We produced orexinDTR mice with the human DTR knocked into the prepro-orexin locus. To induce loss of orexinergic neurons, we intramuscularly injected DTX into heterozygous orexinDTR mice, and later counted orexin-A (OX-A) immunoreactive neurons. Moreover, we collected functional data of EEG/EMG recordings during the dark period in orexinDTR mice. Finally, we evaluated the effects of OX-201 on narcolepsy symptoms, including sleepiness and cataplexy, 6 weeks after DTX injection.

Results: Within 1 week after injection of DTX, the number of OX-A immunoreactive neurons was reduced to 1% of normal with no change in the number of neurons making melanin-concentrating hormone. Furthermore, orexinDTR mice treated with DTX developed severe sleep-wake fragmentation within 1 week, and very frequent cataplexy (~100 episodes/night) in the subsequent weeks. These symptoms were substantially and dose-dependently improved by administration of OX-201.

Conclusion: OrexinDTR mice are a useful and simple model for understanding the neurobiology of narcolepsy and evaluating new drugs to treat narcolepsy symptoms. As only one allele of the orexin-DTR is required, these mice are also convenient for crossing with other lines, enabling a variety of methods to study the orexinergic neurons. OX-201 markedly reduced narcolepsy symptoms. Although it is a tool compound unlikely to be used in

patients, it further demonstrates the potential of high efficacy of OX2R agonists in treating narcolepsy.

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0046

CHEMOGENETIC ACTIVATION OF A2AR NEURONS IN NUCLEUS ACCUMBENS INCREASES SLEEP, AFFECTING COGNITION AND BEHAVIOR IN MICE

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Introduction: Sleep influences various cognitive and physiologic processes; however, the mechanisms through which sleep affects these different functions are not fully understood. The Nucleus Accumbens (NAc) was recently identified as a sleep regulating center. We hypothesized that manipulation of sleep via chemogenetic activation of sleep active Adenosine-2A receptor (A2AR) neurons in the NAc core could induce restorative sleep and affect memory, anxiety and depression-like states in mice.

Methods: We transfected A2A neurons in NAc core of A2AR-Cre transgenic mice with an adeno-associated virus (AAV) carrying the gene sequence for hM3Dq. Using Clozapine-N-Oxide (CNO) at varying concentrations (0.1, 0.3, 0.9, 2.7 mg/kg), we activated these neurons and analyzed EEG/EMG traces for rapid eye movement (REM) sleep, non-REM (NREM) sleep and wakefulness. Mice were then divided into three separate conditions: normal sleep, sleep deprivation or increased sleep for 4 hr. Following this sleep intervention mice underwent the following behavioral tests 1) Novel object recognition (NOR) test for memory, 2) the open field test (OFT) for anxiety and 3) the forced swim test (FST) for depression-like states.

Results: During the first 4 hours of chemogenetic activation of NAc A2AR neurons, we observed a 105% increase of NREM sleep at the highest dose of CNO when compared to saline treatment. REM sleep was increased similarly. Analysis of the behavioral tests revealed that mice in the increased sleep condition tended to perform better at the NOR test, suggesting increased memory performance. In the OFT, sleep deprived mice showed a significant increase in %time spent in the center zone and total distance travelled within the arena. They also spent significantly less time immobile. Sleep deprived mice also exhibited a trend towards spending more time swimming in the FST, indicating lower levels of depression-like states.

Conclusion: Our results suggest that chemogenetic activation of A2AR neurons in the NAc core strongly increases NREM and REM sleep, confirming the importance of these neurons in sleep/wake regulation. Moreover, we observed that increased sleep improves memory performance but does not significantly affect levels of anxiety or depression-like states. Instead, reduced sleep significantly decreases anxiety and tends to reduce depressive-like states.

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0047

MAPPING OREXIN 2 RECEPTOR PATHWAYS THAT IMPROVE SLEEPINESS AND CATAPLEXYTakashi Ishikawa¹, Emi Kurimoto¹, Adam A. Joyal², Thomas E. Scammell²¹ Neuroscience Drug Discovery Unit, Research, Takeda Pharmaceutical Company Limited, ² Department of Neurology, Beth Israel Deaconess Medical Center

Introduction: Narcolepsy type 1 is caused by selective loss of orexinergic neurons, resulting in poor maintenance of sleep and wakefulness, and emergence of cataplexy. Orexinergic neurons innervate many brain regions, and specific narcolepsy symptoms likely arise from dysfunction of distinct brain regions. Orexin 2 receptors (OX2R) are expressed in nearly all wake- and REM sleep-regulatory brain regions, and OX2R agonists improve narcolepsy symptoms in mouse models and human patients. However, the key brain regions and pathways through which OX2R signaling stabilizes wake and sleep and suppresses cataplexy are only partially understood. In this study, we restored OX2R expression in specific brain regions of mice lacking orexinergic neurons and OX2R, and assessed if an OX2R-selective agonist improves specific aspects of their narcolepsy symptoms.

Methods: We produced a murine narcolepsy model with the human diphtheria toxin receptor (DTR) knocked into the endogenous prepro-orexin locus (orexinDTR mice). After injection with diphtheria toxin (DTX), orexinDTR mice have severe and selective loss of orexinergic neurons. We crossed orexinDTR mice with OX2R transcription-disrupted (TD) mice to produce a new narcolepsy model lacking orexinergic neurons and OX2R (OX2R TD::orexinDTR mice). To induce focal expression of OX2R, we microinjected an adeno-associated viral vector coding for Cre recombinase into specific brain regions of OX2R TD::orexinDTR mice. At 6 weeks after DTX injection, we administered an OX2R-selective agonist OX-201 or vehicle orally to OX2R TD::orexinDTR mice expressing OX2R in the specific brain regions and evaluated the effects of OX-201 on narcolepsy symptoms including sleepiness and cataplexy.

Results: In mice expressing OX2R only in the tuberomammillary nucleus (TMN) or basal forebrain (BF) regions, OX-201 significantly improved maintenance of wakefulness but did not suppress cataplexy. In contrast, in mice expressing OX2R in the ventrolateral periaqueductal grey and lateral pontine tegmentum (vlPAG/LPT) regions, OX-201 significantly suppressed cataplexy without improving maintenance of wakefulness.

Conclusion: These findings demonstrate that OX2R signaling in the TMN and BF regions can stabilize wake and sleep, and OX2R signaling in the vlPAG/LPT region can suppress cataplexy.

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Abstract citation ID: zsad077.0048

0048

OREXIN 2 RECEPTOR AGONIST ACTIVATES PRE-BÖTZINGER COMPLEX NEURONS, HYPOGLOSSAL MOTONEURONS AND THE GENIOGLOSSUS MUSCLE IN RODENTSRyuji Yamada¹, Haruhide Kimura¹¹ Neuroscience Drug Discovery Unit, Research, Takeda Pharmaceutical Company Limited

Introduction: Neurons in the pre-Bötzinger complex are critical for the generation of inspiratory rhythm and control the activity of the genioglossus muscle via activation of hypoglossal motoneurons. Activation of the genioglossus muscle causes anterior movement of the tongue and widens the upper airway. As obstructive sleep apnea (OSA) is associated with obstruction of the upper airway, activation of this neuronal pathway may be a novel therapeutic approach. Orexins have been shown to activate these neurons by stimulation of both orexin 1 receptor (OX1R) and/or orexin 2 receptor (OX2R). In this study, we assessed effects of OX2R-selective agonists on activity of neurons in the pre-Bötzinger complex, hypoglossal motoneurons, and the genioglossus muscle.

Methods: OX2R-selective agonists danavorexton (TAK-925) and OX-201 (a tool compound with longer plasma half-life than danavorexton in rodents) were used. Arousal effects were investigated by electroencephalogram/electromyogram recording in C57BL/6J mice and OX2R knockout mice. Activity of neurons in the pre-Bötzinger complex and hypoglossal motoneurons was investigated by electrophysiological recording in rat tissues. Activity of the genioglossus muscle was evaluated by electromyogram recording in anesthetized rats.

Results: Oral administration of OX-201 increased wakefulness time during sleep phase in C57BL/6J mice but not in OX2R knockout mice. In *in vitro* electrophysiological analyses, danavorexton, and OX-201 increased the burst frequency of neurons in the pre-Bötzinger complex (EC50: 300 nM and 760 nM, respectively) and hypoglossal motoneurons (EC50: 610 nM and 260 nM, respectively). Intravenous administration of OX-201 at 1 mg/kg increased burst amplitude of the genioglossus muscle in anesthetized rats.

Conclusion: OX2R-selective agonists may enhance the respiratory function via activation of the genioglossus muscle through stimulation of neurons in the pre-Bötzinger complex and hypoglossal motoneurons. OX2R agonists may have therapeutic potential in patients with OSA if enhancement of respiratory function by OX2R agonists can be observed at non-arousal concentrations. Further preclinical and clinical studies are worth conducting in patients with OSA.

Support (if any): This work was conducted by Takeda Pharmaceutical Company Limited.

Abstract citation ID: zsad077.0049

0049**OREXIN 2 RECEPTOR AGONIST ACTIVATES PRE-BÖTZINGER COMPLEX NEURONS, PHRENIC MOTONEURONS AND THE DIAPHRAGM IN RODENTS**Haruhide Kimura¹, Ryuji Yamada¹¹ Neuroscience Drug Discovery Unit, Research, Takeda Pharmaceutical Company Limited

Introduction: Neurons in the pre-Bötzinger complex are critical for the generation of inspiratory rhythm and regulation of activity of phrenic motoneurons, which control the activity of the diaphragm. Dysregulation of this neuronal network and resulting dysfunction of the diaphragm is associated with central sleep apnea (CSA). Orexins by stimulating both orexin 1 receptor (OX1R) and/or orexin 2 receptor (OX2R) can activate these neurons and the diaphragm. In this study, we assessed effects of OX2R-selective agonists on the activity of neurons in the pre-Bötzinger complex, phrenic motoneurons, and the diaphragm.

Methods: OX2R-selective agonists danavorexton (TAK-925) and OX-201 (a tool compound with longer plasma half-life than danavorexton in rodents) were used. OX2R and OX1R agonistic activities were examined by calcium mobilization assay in hOX2R/CHO-K1 cells and hOX1R/CHO-K1 cells, respectively. Activity of neurons in the pre-Bötzinger complex and phrenic motoneurons was investigated by electrophysiological recording in rat tissues. Activity of the diaphragm was evaluated by electromyogram recording in anesthetized rats. Respiratory activity was evaluated by whole-body plethysmography recording in mice.

Results: Danavorexton and OX-201 showed potent OX2R agonistic activity with 50% effective concentration (EC50) values of 5.5 nM and 8.0 nM, respectively. Danavorexton and OX-201 had >5,000-fold and 1,000-fold OX2R selectivity over OX1R, respectively. In vitro electrophysiological analyses, danavorexton and OX-201 increased the burst frequency of neurons in the pre-Bötzinger complex (EC50: 300 nM and 760 nM, respectively) and phrenic motoneurons (EC50: 1.6 µM and not determined, respectively). Intravenous administration of OX-201 at 1 and 3 mg/kg increased burst frequency of the diaphragm in anesthetized rats and oral administration at 3 mg/kg increased respiratory activity in conscious mice.

Conclusion: OX2R-selective agonists may enhance respiratory function via activation of the diaphragm through stimulation of neurons in the pre-Bötzinger complex and phrenic motoneurons. OX2R agonists may have therapeutic potential in patients with CSA if enhancement of respiratory function by OX2R agonists can be observed at non-arousal concentrations. Further preclinical and clinical studies are worth conducting in patients with CSA.

Support (if any): This work was conducted by Takeda Pharmaceutical Company Limited.

Abstract citation ID: zsad077.0050

0050**PEDIATRIC OSA AND NEURODEVELOPMENT**Arvind Chandrakantan¹, Joy Okoro²¹ Texas Childrens Hospital/Baylor College of Medicine, ² Baylor College of Medicine

Introduction: Pediatric OSA and its associated sleep disorders occur in up to 7% of children. Whereas the sequelae of the disease are well characterized, the underpinnings of its phenotypes

are poorly understood. This is mainly because of a lack of comprehensive model of the disease in the young. Here I present the neurobehavioral phenotype of pediatric OSA utilizing a preclinical murine model.

Methods: This proposal represents a departure from prior models and is embedded in the sculpting of the IH model. 1) Human polysomnographic data: We studied human data in children with OSA 2) Murine oximetry data: we create murine oximetry curves 3) Cross Species Curve Fitting: We cross fit those across species 4) Optimization of hypoxic gas throughputs: We then optimized this for the hypoxia chamber we are using

Results: We examined 4 behavioral tasks over a number of time periods to establish the temporality needed for hippocampal task ablation, as the hippocampus is the center of learning and memory in mammals. 2 tasks were hippocampal dependent: a) Novel object recognition b) Object place recognition. 2 tasks were hippocampal independent: 1) Hot plate: 2) OFA. We utilized 3 time periods initially: exposure from p14 to p23 (9 days acute), to p35 (21 days intermediate), and p70 (56 days, chronic). There was no deterioration in hippocampal tasks from p14 to p35, however at p70 we noted task ablation. We therefore systematically worked backwards, until we discovered the 'tipping point' where hippocampal task ablation is observed is p49 (35 days of exposure). Prior to this, we note no task ablation, however after this time point, hippocampal task ablation is preserved.

Conclusion: We have demonstrated a tractable, temporal model for pediatric OSA over a systematic set of time points to show when hippocampal deficits from the OSA stimulus manifest phenotypically. We have further isolated these deficits to the hippocampus of developing mice, which is the mammalian center of learning, memory, and retrieval.

Support (if any): Arvind has previously received support from AASM and BCM OOR. He is currently supported by 1K08HL161263-01 from NHLBI.

Abstract citation ID: zsad077.0051

0051**SAMELISANT, A H3 RECEPTOR INVERSE AGONIST FOR THE POTENTIAL TREATMENT OF EXCESSIVE DAYTIME SLEEPINESS IN PARKINSON'S DISEASE**Ramakrishna Nirogi¹, Vijay Benade¹, Renny Abraham¹, Jagadeesh Babu Thenthi¹, Surendra Petlu¹, Santosh Kumar Pandey¹, Rajesh Kumar Badange¹, Kumar Bojja¹, Ramkumar Subramanian¹¹ Suven Life Sciences

Introduction: Samelissant (SUVN-G3031) is a potent and selective histamine 3 receptor (H3R) inverse agonist with hH3 Ki of 8.7 nM. Samelissant exhibited desired pharmacokinetic properties and favorable brain penetration in rodents. Preclinical studies demonstrated samelissant produced wake promoting and antiepileptic effects in orexin knockout mice. Additionally samelissant modulated neurotransmitters like histamine in brain indicating neurochemical basis for wake promoting effects. Excessive daytime sleepiness (EDS) estimated to affect 20-50% of patients with Parkinson's disease (PD). Although non-treated PD patients exhibit EDS and sleep attacks, it is often associated with use of dopamine (DA) agonists, especially the recent non-ergot DA D2/3 agonists. Samelissant is currently being evaluated in a Phase-2 study as monotherapy for the treatment of EDS in patients with narcolepsy with or without cataplexy (ClinicalTrials.gov Identifier: NCT04072380).

Methods: Hemiparkinsonism was induced in male Wistar rats by injecting 6-OHDA (12 µg/4 µL) unilaterally into the medial forebrain bundle, and telemetric device was implanted to monitor EEG, EMG and activity. Animals were allowed to recover for 3 weeks prior to initiating EEG recordings. Basal EEG was recorded for 1 hour prior to samelisant administration and EEG acquisition was continued for 6 hours post treatment. After a washout period of 1 week, rats were administered with the quinpirole (30 µg/kg, i.p.) followed by samelisant and EEG acquisition was continued for 6 hours. EEG recordings were processed for sleep stages using NeuroScore and sleep sign software (DSI, MN, USA).

Results: Hemiparkinsonian animals showed decrease in wake and increase in sleep time during dark phase. Treatment with samelisant (10 and 30 mg/kg, p.o.) produced significant increase in cumulative wake period during first 3 hours post treatment. Treatment with quinpirole in hemiparkinsonian rats produced decrease in wake and increase in sleep time. Treatment with samelisant produced dose- dependent increase in wake with decrease in REM and NREM periods in quinpirole treated hemiparkinsonian rats.

Conclusion: The results from current preclinical studies indicate that samelisant may have a potential utility for the treatment of excessive daytime sleepiness in PD patients.

Support (if any):

Abstract citation ID: zsad077.0052

0052

A NOVEL BIOMARKER OF ALZHEIMER'S DISEASE BASED ON HIGH-ORDER INTERACTIONS OF LOW-DENSITY ELECTROENCEPHALOGRAPHY

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Introduction: Alzheimer's disease (AD) causes disruptions in brain functions, which can be tracked by proper analysis of electroencephalography (EEG). Current efforts to understand the impact of AD on brain activity have leveraged the development of high-density EEG. Alternatively, we propose that AD can be discriminated from healthy controls (HC) by analyzing low-density EEG sleep recordings with nonlinear measures that capture functional interactions beyond pairwise such as the total correlation (TC), dual total correlation (DTC), O-information (O) and S-information (S).

Methods: We analyzed overnight polysomnography data with 4 EEG channels (left central, right central, left mastoid, and right mastoid) of 28 older men (14 with a self-reported history of clinical diagnosis of AD and 14 HC, matched in age and education) in the Osteoporotic Fractures in Men Study (MrOS) obtained from the National Sleep Research Resource (NSRR). Each 30-second epoch was scored as wake (W), N1, N2, N3, or rapid eye movement. Features based on low (2) and high order (3-4) interactions between electrodes (TC, DTC, O, and S) were extracted from raw and band-pass filtered data within each wake/sleep stage. Finally, a feature selection algorithm provided the optimal subset of features that maximizes the discrimination between conditions.

Results: AD was discriminated from HC with an average area under the receiver operating characteristic curve of 0.90 ± 0.05 using just 3 features: O (triplet) measured within W stage in the high γ band (40-100 Hz), DTC (triplet) for raw N1 data, and TC (pairwise) in the δ band (0.5-4 Hz) within N stages.

Conclusion: State-of-the-art analysis of high-order interactions can maximize the discrimination of AD using a low-density sleep EEG set-up. The potential of these features to capture the physiopathology of AD and its impact on brain function should be further confirmed using larger samples.

Support (if any): National Institutes of Health (RF1AG059867, RF1AG064312, R01AG057234); ANID/FONDECYT Regular (1210195 and 1210176 and 1220995); Alzheimer's Association (SG-20-725707). MrOS Sleep Study was supported by R01 HL071194, R01HL070848, R01HL070847, R01HL070842, R01HL070841, R01HL070837, R01HL070838, and R01HL070839. The NSRR was supported by R24HL114473, 75N92019R002.

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0053

CIRCADIAN REGULATION IN THE SOCIAL BRAIN: HOW SLEEP DEPRIVATION COMPROMISES EMPATHY

Mark Turnbull¹, Connor Malby¹, Emily Jensen¹, Fatima Sharif¹, Jenna Donninger¹, Stuart Goodall¹, Paul Ansdehl¹, Nayantara Santhi¹¹ Northumbria University

Introduction: The interaction between the circadian clock and sleep drive generates a rhythm of deterioration and recovery in cognition over wake and sleep, respectively. In modern society, our sleep is often disrupted due to long and unsociable work hours. Emerging evidence suggests that this negatively impacts our social interactions, but the physiological mechanisms remain unclear. Our perceptions of other people's mental states dominate interpersonal interactions, and profoundly impact our lives. This study examined how sleep deprivation impacts our perceptions of another's mental state (a cognitive domain known as Theory of Mind: ToM).

Methods: 21 young healthy adults completed the study (11 females: mean age $\pm$ SD = 22.09 ± 3.59 , 10 males: mean age $\pm$ SD = 23 ± 4.13). Over a 12-hour overnight wakefulness period, we examined changes in ToM every two hours with the Reading in the Mind's Eye (RMIE) task. It consists of 36 images, each a pair of eyes representing an emotion, categorized as Easy or Difficult and as positive, negative, and neutral (valence). We measured accuracy based on a 4-forced alternative response. Subjective sleepiness was measured every two hours with the Karolinska Sleepiness Scale (KSS).

Results: Our analysis revealed a significant effect of wakefulness on accuracy ($p < 0.0001$), such that it declined precipitously 4 hours into the protocol (coinciding with midnight). Accuracy was significantly better ($p < 0.01$) for Easy stimuli than on Difficult stimuli, but accuracy on both declined significantly with wakefulness. A similar result was seen with valence ($p < 0.0001$), with Positive stimuli ($74.5\% \pm 1.8\%$) showing a better accuracy (mean $\pm$ 1SE) than negative ($57.4\% \pm 1.9\%$) and neutral ($58.2\% \pm 1.7\%$) ones. But accuracy on all three declined with wakefulness (Positive: $84\% - 72.4\%$; Negative: $61.2\% - 58.5\%$; Neutral: $64.2\% - 59.9\%$). Sleepiness increased significantly overnight ($p < 0.0001$). Furthermore, there was a significant correlation (correlation: 0.5; Fisher's z test: $p = 0.03$) between the change sleepiness and RMIE task accuracy.

Conclusion: These findings are one of first descriptions of the circadian and sleep regulation in Theory of Mind, our ability to empathize. They have significant scientific and clinical implications.

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0054**DOES THE EARLY BIRD GET THE WORM?
ASSOCIATIONS OF WAKETIME VARIABILITY AND
METACOGNITION IN COLLEGE STUDENTS***Amy Costa¹, Kevin McGovney¹, Chloe Rzeppa², Christina McCrae³, Ashley Curtis³*¹ University of Missouri - Columbia, ² University of Missouri, ³ University of South Florida

Introduction: Deviation in sleep patterns have been associated with cognitive functioning in college students, but little research has examined how deviation in bed and waketime impact next-day metacognition. Given college students have high daily variability with their bedtime and waketime, these are understudied parameter of interest in this population. Considering metacognition has been associated with academic outcomes (e.g., GPA), it is important to understand how daily bedtime and waketime patterns might impact metacognition. The present study examined how daily deviation from bedtime and waketime are associated with metacognitive ratings in college students.

Methods: College students (N=81, Age=18.8, SD = 1.1, 64 females) completed seven days of sleep diaries reporting bedtime, sleep duration, and waketime. Students also provided morning metacognitive ratings regarding the perceived quality of mental functioning from very poor (0) to very good (100). Multilevel modeling analyses tested whether intraindividual patterns of associations between daily bedtime and daily waketime and daily morning metacognitive ratings, after controlling for intraindividual daily anxiety severity, interindividual levels of bed/wake time variability and sleep duration, as well as age, sex, and daily sleep medication usage.

Results: Daily waketime was associated with same morning metacognitive ratings ($B=.02$, $p=0.03$), in that those who woke up earlier than their typical average reported worse cognitive function. Findings did not reveal an association between bedtime variability and metacognition.

Conclusion: Findings suggest that regardless of how long one has slept, waking up earlier than typical may negatively impact perceptions of cognitive functioning in college students. Similar patterns are not observed at the average/interindividual level. Given younger adults typically have a delayed circadian preference, findings may reflect acute circadian disruption and associated “brain fog” in college students when waking up earlier than typical. Future studies should examine associations between daily waketime and objective cognition to better understand how regularity impacts daytime functioning. Similar to findings in adolescent populations, such evaluations could inform recommendations regarding college class start times.

Support (if any):

Abstract citation ID: zsad077.0055

0055**EFFECT OF ACUTE SLEEP RESTRICTION ON SLEEP
PHYSIOLOGY AND EMOTIONAL IMAGERY MEMORY IN
SCHIZOPHRENIA***Korey Kam¹, Luz Ospina², Samantha Fagan², Katie Beck-Felts², Sylvie Messer², Daphne Valencia¹, Mayreli Balbuena²,**Vladimir Aybar², Anna Mullins¹, Ankit Parekh¹, David Rapoport¹, Indu Ayappa¹, Andrew Varga¹, David Kimhy²*¹ Icahn School of Medicine at Mount Sinai, ² Icahn School of Medicine Mount Sinai

Introduction: Cognitive dysfunction in individuals with schizophrenia (SZ) represents a major determinant of poor functioning and may arise in part due to deficits in sleep quality that have been reported in in this population. In the current project, we investigate the effect of acute sleep restriction on a sleep-dependent emotional memory task.

Methods: Six individuals with medication-controlled SZ encoded consensus-rated emotionally valent and neutral pictures from the International Affective Picture System in the evening before 2 counterbalanced, polysomnographically-recorded nights containing either ad libitum sleep (~11pm to 7am) or sleep restriction (SR) to 4 hours between 3 and 7 am. Image recall occurred within 1 hour of wake time. We compared memory performance for negative emotional/neutral memory and PSG measures across the two sleep conditions with paired signed-rank tests.

Results: Mean age was 38 years and 50% were women. Acute sleep restriction resulted in reduced total sleep time (Adlib: median 372 min. (interquartile-range 53) vs SR: 209 (16) min., $p=0.03$), including reduction in duration of N1 (Ad lib: 44 min. (44) vs. SR: 29 min. (33), $p=0.03$), N2 (Ad lib: 158 min. (86) vs. SR: 60 min. (33), $p=0.03$) and REM sleep (Ad lib: 18 min. (5) vs. SR: 13 min. (13), $p=0.03$). We did not observe differences in N3 duration, sleep efficiency, and arousal index. Measures of breathing such as AHI4%, AHI3A, and SpO2 nadir were not significantly different between conditions. Compared to SR, the false alarm rate for emotional images was increased in ad lib sleep ($n=6$, $p=0.03$) with no difference in false alarm rate for neutral images ($p=0.19$). Correct rejection rate for emotional images was increased in SR compared to ad lib sleep ($p=0.03$) with no difference in neutral images ($p=0.19$). No other change was observed in accuracy of recall for emotional or neutral, miss rate for emotional or neutral and d-prime for emotional or neutral images.

Conclusion: In subjects with SZ, unrestricted sleep was associated with a greater false alarm rate for emotional, but not neutral scenes, suggesting a deficit in veridical memory or generalization of emotionally encoded information.

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0056**SLEEP CHARACTERISTICS PREDICT METACOGNITIVE
FUNCTIONING ABOVE-AND-BEYOND AGE, EDUCATION,
AND MOOD***Spencer Nielson¹, Natalie Dautovich¹, Joseph Dzierzewski²*¹ Virginia Commonwealth University, ² National Sleep Foundation

Introduction: Metacognition, also-known-as subjective cognitive functioning, is an important predictor of cognitive decline and previous work has identified age, education, and mental health symptoms as important predictors. Sleep is essential for optimal neurocognitive functioning; as such, sleep may also

play an important role in determining estimates of metacognition. However, it is currently unknown if sleep is associated with metacognition above-and-beyond known predictors. This study aimed to investigate whether sleep characteristics, including insomnia symptoms, global sleep health, and sleep regularity, were associated with metacognitive functioning above-and-beyond known predictors of age, education, and mood.

Methods: Participants (N=3284) included adults (Mage=42.7 years, 48.5% female) who completed an online study investigating sleep and health across the lifespan. Participants self-reported their age and education and completed various questionnaires including the 6-item PROMIS Cognitive Function questionnaire, the Patient Health Questionnaire-4 (PHQ-4), the Insomnia Severity Index (ISI), the RU-SATED sleep health questionnaire, and the Sleep Regularity Questionnaire (SRQ). Stepwise regression models were used to investigate whether ISI, RU-SATED, and SRQ scores predicted PROMIS Cognitive Function scores after accounting for age, education, and PHQ-4 scores.

Results: In Step 1 of the model, age and education significantly predicted metacognitive functioning ($\beta=.146$, $t=8.44$, $p<.001$; $\beta=.086$, $t=4.97$, $p<.012$). In Step 2, PHQ-4 scores and education were significant while age was no longer significant ($\beta=-.589$, $t=-40.56$, $p<.001$; $\beta=.03$, $t=2.10$, $p=.036$). In Step 3, age, education, and RU-SATED scores were not significant predictors while scores on the PHQ-4, ISI, and SRQ were significant predictors of metacognitive functioning ($\beta=-.346$, $t=-21.93$, $p<.001$; $\beta=-.38$, $t=-20.20$, $p<.001$; $\beta=.052$, $t=3.20$, $p=.001$). Step 3 accounted for a significant increase in variance explained ($\Delta R^2=.121$, $F=497.07$, $p<.001$).

Conclusion: Sleep characteristics, including insomnia symptoms and sleep regularity, are associated with metacognition above-and-beyond known predictors including age, education, and mood. Sleep characteristics may be an important part of estimates of metacognition. Moreover, because sleep is a modifiable risk factor with effective treatments, it may have potential as a treatment target for cognitive decline. Further research is needed to investigate whether the sleep-metacognitive functioning differs between common demographic groups and whether sleep disturbances predate declines in metacognitive functioning or vice versa.

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0057

THE IMPACT OF CORTICAL OXYGENATION DURING SLEEP-DISORDERED BREATHING ON COGNITION

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Introduction: Untreated sleep-disordered breathing (SDB) has been reported as a common risk for dementia. However, the association between current SDB parameters (i.e., AHI) and cognition is not straightforward. To examine the impact of cortical oxygenation during SDB on cognition in older adults, we measured the coherence of oxyHb and SpO2 during SDB, in which a higher level can represent less protection against systemic hypoxia, is associated with cognition in older adults.

Methods: Thirty-eight community-dwelling, healthy older adults without dementia (20 women) were recruited. The mean and standard deviation (SD) of age was 72.6 ± 6.4 years. All participants underwent comprehensive neuropsychiatric evaluation of short and long-term verbal memory (Wechsler Memory Scale & Rey Auditory Verbal Learning Test), Executive Functioning (Delis-Kaplan Executive Function System), verbal naming abilities (Boston Naming Test), and visuo-spatial ability (Judgment of Line Orientation). We performed a simultaneous PSG and NIRS recording overnight at the participants' houses. We measured the mean max coherence of oxyHb and SpO2 and analyzed its correlation to cognition.

Results: The mean and SD of total sleep time, N1, N2, N3, and REM were 392.8 ± 71.8 min, 65.5 ± 60.3 min, 210.7 ± 68.5 min, 53.1 ± 30.9 min, and 63.5 ± 25.4 min. The mean and SD of AHI were 21 ± 17.4 events/hour. The mean and SD of the max coherence ratio were 0.78 ± 0.10 . Linear regression analysis found higher coherence of oxyHb and SpO2 to be significantly correlated, after Bonferroni Correction, with a poorer score on the age-corrected BNT score ($t = -3.174$, $p = .003$), covaried for gender and education.

Conclusion: Higher coherence of oxyHb and SpO2 during SDB may predict poorer verbal naming abilities in older adult

Support (if any): National Institute on Aging

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0058

THE SLEEPY EYEWITNESS: SELF-REPORTED SLEEP PREDICTS EYEWITNESS MEMORY

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Introduction: Sleep is critical for memory, but research indicates that eyewitness identification may be an exception. We conducted three experiments to assess the effect of self-reported sleep duration and quality, and current sleepiness on eyewitness recall for a mock crime and suspect identification. Experiments 1 and 2 looked at pre-encoding sleep on lineups and showups, respectively. Experiment 3 investigated lineups across two days to assess retrieval effects.

Methods: Participants viewed a mock crime video then answered sleep questions as well as central and peripheral recall questions over the crime. Participants were then randomly assigned to view a fair 6-person target-present (TP) or target-absent (TA) lineup for experiments 1 and 3, or a TP or TA showup for experiment 2. In experiment 3, the recall questions and lineups occurred on day 2, but the sleep questions were asked both days. Decision confidence was provided after the identification procedure.

Results: Sleep quality predicted central recall for experiment 1 [$F(1, 3834)=12.96$, $p<.001$] whereas sleep quantity predicted central recall for experiment 2, $F(1, 2712)=36.22$, $p<.001$. Choosing rate for pre-encoding sleep was higher for low quality [$X^2(1)=29.10$, $p<.001$] and low duration [$X^2(1)=20.15$, $p<.001$], but false IDs were lower for high duration [$X^2(1)=29.76$, $p<.001$] and high quality, $X^2(1)=35.47$, $p<.001$. High quality self-reported sleep increased discriminability for lineups, $G=2.14$, $p=.016$. False IDs for showups were lower for high duration [$X^2(1)=5.27$, $p=.024$] and all three sleep questions predicted discriminability for showups: more sleep ($G=2.85$, $p=.002$), better sleep ($G=2.60$, $p=.005$), and less sleepiness, $G=2.44$, $p=.007$. Showups had greater accuracy ($p=.038$) and a stronger confidence-accuracy relationship ($p<.001$) for the average of the "good sleep" conditions than

the average of the three “bad sleep” conditions, $p=.022$. In experiment 3, involving post-encoding self-reported sleep, there were still effects on recall but minimal effects on eyewitness identification (and no effects on discriminability).

Conclusion: Self-reported sleep for the night prior to the crime could be an important individual difference variable for eyewitness memory, affecting encoding more than post-encoding processes.

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0059

ACOUSTIC ENHANCEMENT OF SLEEP SLOW OSCILLATIONS NESTED TO SPINDLES RELATIVE TO DELTA WAVES IMPROVES MEMORY CONSOLIDATION

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Introduction: The nesting of electroencephalographic (EEG) sleep slow oscillations (SOs) to spindles has been shown to be important for sleep-dependent memory consolidation. However, recent evidence indicates that a higher proportion of SOs nested to spindles, relative to δ waves, might be even more critical for sleep-dependent memory consolidation. Acoustic stimulation during slow wave sleep has been shown to be effective in improving memory consolidation. Here, we examined the contribution of SOs nested to spindles relative to δ waves on sleep-dependent declarative memory consolidation associated with acoustic stimulation.

Methods: Twenty subjects (18-35 years, 75% females) participated in a randomized cross-over study. At each visit participants received either stimulation (stim) or sham following an adaption night. Stim occurred in blocks of 5 pulses (ON intervals) followed by a period of equal length with no stimulation (OFF intervals). Participants learned 40 Arabic-English word pairs and were tested before sleep and after sleep in the morning and again in the afternoon. Detection of SOs (< 2 Hz), δ waves (2-4 Hz), spindles (11-16Hz), and the ratio (%) of spindles nested to SO over δ waves (SO/ δ Nesting Index) were calculated during ON intervals for stim and sham conditions.

Results: Overnight mean (SD) percentage change in word recall between conditions was similar in the morning (stim 6(3)%, sham 4(6)%, $p=0.68$), but was higher in the afternoon in stim compared to the sham condition (stim 10(4)%, sham 4(6)%, $p=0.02$). The SO/ δ Nesting Index was higher in stim compared to the sham condition (stim 21(13)%, sham 13(10)%, $p=0.004$). Within-subject improvement from sham to stim condition in afternoon memory was associated with a greater change in SO/ δ Nesting Index ($R=0.63$, $p=0.03$), this association was not observed for spindles nested to SOs ($R=0.33$, $p=0.202$) or spindles nested to δ waves ($R=-0.18$, $p=0.811$).

Conclusion: Enhancement of memory consolidation with acoustic stimulation may be dependent on its ability to increase SOs nested to spindles relative to δ waves. Dynamic changes in the relationships between SOs, δ waves and spindles can help inform novel EEG-derived markers and targets to enhance sleep-dependent memory consolidation.

Support (if any): DARPA award W911NF-16-2-0021

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0060

A CLASSIFICATION BASED GENERATIVE APPROACH TO SELECTIVE TARGETING OF GLOBAL SLOW OSCILLATIONS DURING SLEEP

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Introduction: Interacting with sleep slow oscillations (0.5,15 Hz) is essential to understanding the mechanisms underlying their role in sleep functions, including homeostasis, synaptic reorganization, and memory consolidation. Current approaches to SO-based non-invasive closed loop alternate current stimulation (cl-tACs) focus on timing, and do not differentiate among oscillations based on their space-time profiles. In this study, we leverage machine learning and global optimization to introduce a generative model of brain stimulation protocols targeting Global SOs.

Methods: We identify a stimulation protocol that matches a Global SO in two stages: first focusing on the electrode montage, and then on the stimulation waveform. Using the sleep night of 22 volunteers acquired in the lab with high density EEG (175 electrodes), we labeled the SOs as Global/non-Global SOs based on their co-detection on the scalp at a small delay (0.4s). We used the current density (CSD) profile of each SO in cortical and subcortical regions to develop a well-trained classifier (based on weighted k-nearest neighbors). We identify as optimal the electrode montage that resulted in CSDs labeled as Global with highest likelihood by the classifier. We then parameterized a sinusoidal waveform and identified optimum parameters with a genetic algorithm that used feature ranking to establish a weighted distance metric to target Global SO profile built from sleep data. We repeat this approach focusing on Global SO dynamics at a slow time scale and a faster time scale (200ms vs 20ms resolution).

Results: We identified optimal stimulation profiles matching Global SOs at both time scales. At slow time scale, montage selection relied only on CSD near the SO trough and in the reward network and the brainstem. Linear waveforms over-performed sinusoidal waveforms for fit at low time scales. At fast time scale, CSD at both trough and 500ms before the trough were strongly selective for Global vs. non-Global SO.

Conclusion: Global SOs are a gating mechanism for large-scale neural communication, a necessary substrate for systems consolidation and long-term memory formation. This data-driven method builds on natural sleep data to shape a stimulation protocol that imitates Global SO dynamics and is generalizable to other SO types.

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0061

BACKGROUND CONTEXT BUT NOT SLEEP FACILITATES VISUAL EPISODIC MEMORY FOR OBJECTS

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Introduction: Context serves as a retrieval aid and supports accurate recollection of elements within an episodic event.

Associative links between elements of the episode can be weakened via decontextualization. Memory traces are considered to be decontextualized when they have undergone a process that makes them less context-dependent and more gist-like. Furthermore, sleep has been shown to facilitate consolidation of newly formed verbal memories, particularly when sleep occurs shortly after learning. The current study sought to better understand what supports accurate retrieval of visual episodic memories and whether they are modulated by sleep. We examined changes in memory accuracy following either a daytime nap or an equivalent period of quiet wakefulness when background context was changed or reinstated at retrieval.

Methods: Participants were presented with target objects that either appeared in the same scene across multiple trials or in changing scenes during encoding. Memory for target objects was tested using a two-alternative-forced-choice task before and after a 90-min daytime nap (or equivalent period of quiet wakefulness). During testing, the targets either appeared in the same scene context or in a new scene.

Results: Preliminary behavioural results suggest that recognition accuracy significantly decreased from Test 1 to Test 2. However, there was no difference in recognition scores after a nap compared to a period of quiet wakefulness. Recognition was highest, at both tests, when the encoding context was reinstated. There was no difference in recognition between when the context was continually changing and when there was one context change between study and test.

Conclusion: When it comes to visual episodic memory, context plays a predominant role in accurate retrieval of the elements within the scene. The present results suggest that reinforcing the target object with consistent reinstatement of background context facilitates accurate object retrieval. Context reinstatement strengthened the object-to-scene binding, improving recognition accuracy. This effect remains robust regardless of whether learning was followed by a period of sleep or quiet wakefulness, suggesting that context rather than consolidation during sleep plays a key role in visual episodic memory retrieval.

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0062

SLOW OSCILLATORY TRANSCRANIAL DIRECT CURRENT STIMULATION DURING RESTRICTED NIGHTTIME SLEEP ENHANCES MEMORY CONSOLIDATION

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Introduction: Slow oscillatory transcranial direct current stimulation (SO-tDCS) during the first 30 min of nighttime sleep has been shown to improve memory consolidation of word pairs encoded immediately prior to sleep onset. We examined whether SO-tDCS administered during the second half of a restricted nighttime sleep opportunity likewise improves memory consolidation for previously encoded word pairs and mitigates subsequent performance deficits.

Methods: After three nights of baseline sleep in the laboratory, healthy subjects (ages 18-33, n=27, 17 females) were administered SO-tDCS (N=12) or SHAM (N=15) during the second

hour of a 2h sleep period (between the hours of 23:00 and 03:00). Prior to this 2h sleep period, subjects were presented a series of 55 word-pairs. They were asked to recall 46 of the pairs immediately after learning (T0), and again at 20 min (T20) and 120 min (T120) post-awakening. Number of pairs recalled at T20 and T120 relative to T0 were analyzed with a mixed-effects ANOVA. Negative values indicate that subjects forgot pairs post-awakening relative to the initial learning recall.

Results: Subjects correctly recalled 35.0 ± 9.2 words (mean $\pm$ SD) at T0. Relative to T0, subjects in the SHAM condition correctly recalled significantly fewer words post-awakening than those in the SO-tDCS condition (SHAM: -0.8 ± 1.6 words; SO-tDCS: 0.3 ± 1.3 words; $F=6.20$, $p=0.02$), and fewer words at T20 than T120 (T20: -0.6 ± 1.5 words; T120: -0.1 ± 1.6 words; $F=4.67$, $p=0.04$). On average, subjects in the SHAM condition forgot words upon awakening relative to T0 (T20: -1.0 ± 1.4 ; T120: -0.6 ± 1.7 words), while those in the SO-tDCS condition forgot few to no words at T20 (0.0 ± 1.5 words) and actually recalled more words at T120 than T0 (0.6 ± 1.1 words).

Conclusion: Participants in the SHAM condition recalled fewer words after the restricted sleep period, whereas those in the SO-tDCS group increased recall following 2h of sleep. The present findings have important implications for the development of fatigue mitigation strategies during military operations, when sustaining performance in the face of insufficient sleep is critical.

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0063

SLOW-WAVE SLEEP ONSET LATENCY MEDIATES IMPROVEMENTS IN ATTENTION AND PROCESSING SPEED FOLLOWING CONTINUOUS THETA-BURST (CTBS) TMS

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Introduction: Insomnia causes substantial health-care cost burden and is a risk factor for neurocognitive impairment. Increased DMN activity has been implicated in the hyperarousal theory of insomnia. In this pilot clinical trial, DMN was targeted via the left inferior parietal lobe using a brief 40 second cTBS Transcranial Magnetic Stimulation (rTMS). We hypothesized that neurocognitive improvements due to cTBS would be mediated by polysomnographic (PSG) parameters of slow wave sleep.

Methods: Twenty participants (12 female; age=26.9, SD=6.6 years) meeting criteria for insomnia completed a counterbalanced sham-controlled crossover design in which they served as their own controls on two separate nights of in-laboratory assessments. Sessions for both conditions included neurocognitive assessments at baseline, after stimulation (cTBS/sham) before bed, and the following morning. After stimulation, participants were allowed an 8-hour sleep opportunity from 2300 to 0700 monitored with PSG. The symbol coding and digit span subtests of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) exam are the main assessments in the current investigation.

Results: Improvements in attention and processing speed were observed after a night of sleep following both active TMS (cTBS; $B = 11.05$, $p < .001$) and sham TMS conditions ($B = 8.10$, $p = .002$) the prior day. In the cTBS condition only, these improvements in attention were mediated by latency to slow wave sleep (N3), such that shorter latencies were related to greater improvements on a simple attention task (RBANS digit span; $B = -0.75$, $p < .001$). This effect of night to morning improvement in attention and processing speed was also found in the sham condition for the coding task ($B = 60.81$, $p < .001$), but not for digit span. No effects of slow wave sleep duration on RBANS coding or digit span were observed in either condition.

Conclusion: Improvements in simple attention performance in response to cTBS may be, in part, due to slow wave sleep parameters. Moreover, results suggest that simple attention may have been more sensitive to the effects of cTBS, whereas processing speed may have been a factor of lower slow wave sleep onset latency.

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0064

TRADING SLEEP FOR LEARNING TIME IMPROVES NEXT-DAY RECALL, BUT WITH POORER RETENTION OF ITEMS LEARNED DURING SLEEP DEPRIVATION

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Introduction: Sleep is important for learning and memory retention. However, students often cram for examinations by staying awake late to study. We tested the hypothesis that trading sleep for learning time leads to better next-day recall, but items learned during sleep deprivation will be more poorly retained.

Methods: Seventy healthy adults (18–24 years; 32 males) participated in an overnight laboratory study and were tasked with learning the meanings of 120 pseudowords using digital flashcards. Half of participants were randomly assigned to 8 h of TIB for sleep (23:00 to 07:00) and the other half to 4 h of TIB for sleep with a later bedtime (03:00 to 07:00). The 8-h TIB group was given 3 learning sessions (17:50, 19:50, and 21:50) with each flashcard shown twice per session. The 4-h sleep group was given an additional 2 learning sessions that occurred during the night (23:50 and 01:50). Cued-recall performance was tracked during pre-sleep learning, and participants were tested the following morning (09:30) on 60 randomly selected flashcards.

Results: Prior to sleep, the 4-h TIB group learned more items than the 8-h TIB group (Mean score $\pm$ SD: 4-h TIB, 85.31% $\pm$ 20.92%; 8-h TIB, 63.76% $\pm$ 24.22%) because they successfully encoded new items during their additional nocturnal learning sessions. On the following morning, the 4-h TIB group had significantly higher scores on the cued-recall test compared with the 8-h TIB group (Mean score $\pm$ SD: 4-h TIB, 83.71% $\pm$ 23.50%; 8-h TIB, 70.10% $\pm$ 24.18%; Mann-Whitney U test, $p < 0.001$). However, items learned during the final learning session before sleep were retained significantly better in the 8-h TIB group compared with the 4-h TIB group (4-h TIB, 76.64%; 8-h TIB, 91.35%, Chi-squared = 20.43, $p < 0.001$).

Conclusion: There was a trade-off of exchanging sleep for additional learning time. More learning time at the expense of sleep resulted in better next-day test scores but recall performance was poorer for items newly learned during partial sleep deprivation. Our findings help to explain why students often sacrifice sleep for short-term gains in test performance despite poorer memory retention.

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0065

A NOVEL AUTOMATED TASK FOR SPATIAL LEARNING IN RODENTS

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Introduction: Spatial learning in rodents is useful for addressing a variety of research questions. We set out to create a fully automated spatial learning task that required rodents to make a sequence of cued navigational decisions. We used this maze to investigate the impact of sleep on insight gain, a sudden rather than gradual acquisition of a skill or behavior.

Methods: We designed a circular four-quadrant elevated maze. Each quadrant had three choice points on a branched arm, consisting of a reward well and cue light. To discourage rats from backtracking, motorized doors were placed between quadrants. Rats were trained to follow the light for a water reward. Their position was tracked by custom MATLAB code processing live video from a ceiling-mounted camera; the code also controlled all components of the maze, calculated and presented novel routes through the maze, analyzed results in real time, and maintained records of each rat across sessions. After an average of five days rats reached criterion in pretraining (following lights in pseudorandom positions) and were taught a hidden rule: the direction cued on the second quadrant was the correct direction on the fourth (uncued) quadrant. Rats completed one session each in the morning and afternoon, separated by 3h of sleep opportunity or sleep disruption, achieved by gentle handling. This was repeated after a night of sleep opportunity or sleep disruption for a total of four sessions.

Results: Rats quickly learned and consistently chose the correct well, remaining motivated for 96 consecutive trials. Rats were said to have gained insight if they demonstrated significant learning of the hidden rule. Although no animals have yet met this criterion, there was a trend of sleep-disrupted rats performing worse, suggesting that sleep plays an important role in consolidating the spatial rules of the task.

Conclusion: The versatility of this maze can accommodate many tasks not limited to insight gain specifically. Delivering rewards consistently at multiple distinct locations is a valuable technique for investigating spatial learning, navigation, and decision making, making this maze a powerful tool for investigating interventions for disease models that implicate the hippocampus or striatum.

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0066

CONTINUOUS THETA BURST TRANSCRANIAL MAGNETIC STIMULATION FOR INSOMNIA AND ITS EFFECTS ON VERBAL RECALL PERFORMANCE

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Introduction: In this project, we studied the efficacy of focused inhibitory stimulation using continuous theta burst stimulation (cTBS) repetitive transcranial magnetic stimulation (rTMS) on an easily accessible region of the default mode network (DMN). As reported elsewhere, we found that cTBS improved brain connectivity and objectively measured sleep. However, there is little known about the side effects of rTMS in the treatment of insomnia, so here we evaluated the effects on verbal memory recall.

Methods: Twenty adults with clinical insomnia completed this study (Mage=26.90, SD=6.56). Participants conducted two overnight visits during the study; one where they received active cTBS and one where they received a sham cTBS prior to sleep. Participants completed the California Verbal Learning Test (CVLT) before stimulation and again completed the recall portion following a night of laboratory monitored sleep. We analyzed CVLT recall performance with a repeated measures ANOVA with factors of condition (active cTBS vs. sham cTBS) and session (Short Recall, Long Recall, Cued Recall, and Recognition).

Results: Contrary to our hypothesis, our analyses indicate there was no significant effects on recall performance due to active cTBS. There was no main effect of condition on recall scores post-TMS administration ($F(1, 18)=1.162, p=.220, \eta^2=0.082$). There was no interaction effect of active or sham cTBS on recall performance ($F(4, 15)=.828, p=.528, \eta^2=0.181$). Posthoc pairwise comparisons demonstrated that there was no significant difference post-TMS administration between active cTBS and sham cTBS conditions on long recall, cued recall, or recognition ($p>.05$). There was no significant difference post-TMS administration on short-term recall performance. Participants scored lower on short term recall after receiving active cTBS ($M=12.632; SD=2.910$) than after sham cTBS administration ($M=13.42; SD=2.545$) ($p=.048$).

Conclusion: Compared to sham, active cTBS was not associated with any significant difference in long-term recall performance after TMS administration. While the results demonstrate there are short term effects to recall after administration, recall scores bounce back shortly after. While participants didn't necessarily improve with active cTBS, it is beneficial to know there are no long-term harmful effects of active cTBS on recall as side effect of insomnia treatment.

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0067

DREAMS AND PERSONALITY INFLUENCE CREATIVITY

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Introduction: Theoretically, during dreaming, weak associations are explored, and information is combined in novel ways, which could lead to increased creativity during waking. However, little research has explored direct relationships between dreaming and objective measures of creativity and the ability to creatively solve problems. Furthermore, personality influences dream recall frequency (DRF) and other aspects of dreaming, suggesting that the relationship between dreaming and creativity may vary based on personality. The goal of the current experiment was to determine if DRF is related to creativity and creative problem-solving, and if these relationships are influenced by personality traits.

Methods: Seventy-six participants completed questionnaires about dreaming and the Big 5 personality traits (neuroticism, conscientiousness, openness, extraversion, agreeableness) and completed creativity and creative problem-solving tasks. Two tasks measured creativity. In one task, participants generated as many possible uses for an object as they could in one minute. In the other, they generated novel captions for five cartoons. Creative problem-solving was measured using two classic insight problem sets: the matchstick and compound remote associates tasks. Correlations were conducted to determine if DRF is related to any personality traits and multiple regressions were conducted to determine whether DRF or any personality traits predict creativity or creative problem-solving.

Results: DRF was negatively correlated with agreeableness, such that individuals higher in agreeableness recalled fewer dreams. The multiple regression analyses revealed that both DRF and conscientiousness are significant predictors of divergent thinking. Neither DRF nor any personality traits predicted creative problem-solving.

Conclusion: These results indicate that agreeableness reduces the frequency of dream recall, perhaps because agreeable individuals try to find problem solutions immediately while awake so they do not worry about them later. Consistent with current theories, frequently recalling dreams increased creativity, suggesting that the exploration of weak or novel relationships during dreaming increases creativity while awake. Conscientiousness also predicted creativity, suggesting that self-sufficient people tend to be more creative. However, frequently recalling dreams did not increase the ability to creatively solve problems. Collectively, these results suggest that personality influences dreaming behaviors and that frequent dreaming and conscientiousness promote creativity.

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0068

EFFECT OF DUCHENNE MUSCULAR DYSTROPHY ON SLEEP-DEPENDENT CONSOLIDATION OF EPISODIC MEMORY: PILOT

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Introduction: About 50% of patients with Duchenne muscular dystrophy (DMD) exhibit learning and memory deficits. Sleep issues are also common in DMD, and their potential relevance to cognitive deficits is unexplored. In this pilot study, we investigate the effect of DMD on sleep-dependent consolidation of episodic memory, with a focus on the role of sleep-brain dynamics.

Methods: We studied boys aged 6–15 years who were typically developing (TD) or had DMD. First, we compared memory performance in an episodic memory task during a day of wake versus a night of sleep within subjects (Phase 1, $n = 13$), including a one-week sleep diary, and parent-rated, memory, and cognitive assessments. In Phase 2, we measured memory improvement in the same task across a night with polysomnography (24 head electrodes). Sleep was scored with AASM criteria. Slow oscillations

(SO) (0.5-1.5 Hz) and spindles (10-16Hz) were detected algorithmically, assessing density, amplitude, and coordination.

Results: In Phase 1, data confirmed sleep-specific gains in memory performance when task difficulty was adjusted to our extended age range (mean accuracy change: 7% sleep, 0% wake). The DMD participant in Phase 1 exhibited worse immediate recall compared to TD peers (independent samples t-test; $t(9) = -4.38$, $p = .02$) and worse parent-rated sleep habits ($t(9) = 4.01$, $p = .03$ on Children Sleep Health Questionnaire). Phase 2 showed a physiological range of SOs and spindles density, amplitude, and duration in both groups, with potential differences in overall sleep quality.

Conclusion: This pilot study established the feasibility of a sleep-memory experiment including polysomnography in controls and DMD patients in the context of a pediatric research hospital. Data suggests the need for adaptive recruitment approaches for the DMD population in expanding the study. Sleep EEG analysis suggests the potential for subtle differences in DMD sleep brain dynamics that need to be investigated in a larger sample size.

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0069

EFFECTS OF DEPRESSION AND ANXIETY SYMPTOMS ON SLEEP-DEPENDENT CONSOLIDATION OF EMOTIONAL MEMORY IN COLLEGE STUDENTS

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Introduction: Depression and anxiety have been associated with emotional memory biases, disturbed sleep, and cognitive deficits. The goal of the present study is to investigate the effects of elevated levels of depressive and anxiety symptoms on sleep physiology and sleep-dependent consolidation of emotional memory and reactivity over a mid-day nap in young college students.

Methods: Data collection is ongoing, preliminary analyses are based on 34 participants (26F, 7M, 1 non-binary, 18-27 yrs). Based on well-validated depression and anxiety scales, participants were classified into high ($n=10$) vs low ($n=24$) symptom groups. Participants studied negative and neutral picture stimuli and rated them on the dimensions of valence and arousal. Recognition memory was tested after a 5 hr interval which included a high-density EEG monitored 90 min nap.

Results: We do not observe any group differences in memory accuracy (d') or in selectivity for emotional stimuli. In the entire sample, depressive symptoms correlate with decision criterion (C) for negative stimuli ($r = -0.357$, $p=.04$), such that individuals with higher depressive symptoms have a more liberal responding bias for negative stimuli. Napping is associated with a decrease in arousal ratings across all participants ($F(1,32)=5.43$, $p=.03$), and the high mood symptom group rate stimuli as more arousing ($F(1,32)=13.96$, $p<.001$). Further, high levels of trait anxiety is associated with more negative valence ratings post-nap ($r = -0.350$, $p=.03$).

Conclusion: The effects of a mid-day nap on memory consolidation and reactivity for emotional stimuli are similar between individuals with high vs low levels of mood symptoms, but heightened levels of depression and anxiety are associated with altered response bias and higher emotional reactivity. Future plans involve comparisons of NREM oscillations between groups and investigation of their relations with task performance.

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0070

FATIGUE STATE DOES NOT IMPACT ATTENTION TO LEARNABLE INFORMATION IN 17-MONTH-OLD INFANTS BUT AFFECTS RETENTION

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Introduction: Sleep restriction and fatigue negatively impacts learning in adults, but the effect of fatigue on learning in infants remains unexplored. During their first two years infants frequently cycle through periods of wakefulness and sleep. Thus, infants often encounter new information in an unrested state. How might mild fatigue impact their attention and learning? Given that infants devote more attention to new learnable than new unlearnable patterns (Gerken et al, 2011) how might their physiological state impact the cognitive resources required to attend to and learn new information?

Methods: We randomly assigned 80 17-month-old infants (Mage=17.06m, SD=1.85, Female=38) to a rested or unrested condition corresponding to their participation just after or before their typical nap. Within conditions, we randomly assigned infants to a learnable or unlearnable artificial language. We measured time to habituate over blocks of 4 trials that ended when total looking time over a fixed window of four trials reduced to less than 50% of total looking time across the prior four trials. We tested retention after a 5-minute delay in the learnable condition by measuring mean looking time for 8 trials with new grammatical stimuli vs. 8 trials with ungrammatical stimuli. Thus, we evaluated whether physiological state impacted 1) habituation during initial language exposure and 2) discrimination of grammatical vs. ungrammatical language structure, or learning.

Results: First, does state of fatigue impact infants' attention to learnable vs. unlearnable stimuli? Infants attended longer to learnable than unlearnable stimuli regardless of physiological state ($t(78)=2.043$, $p=.044$, $ML=175.77$, $MU=140.51$). Second, does state affect learning? Fatigued infants discriminated grammatical from ungrammatical stimuli at test ($MG=6.81s$, $MUG=8.24s$; $t(17)=-2.26$, $p=.037$), but rested infants did not ($MG=6.69s$, $MUG=6.59s$, $t(13)=.26$, $p=.80$).

Conclusion: Fatigue does not appear to impact infants' ability to detect learnable information but may impact their ability to learn and retain that information. All infants eventually acquire their native language, but mild fatigue, whether reflecting an enhanced physiological or cognitive learning state, appears to contribute to more rapid learning.

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0071

INDIVIDUAL DIFFERENCES IN SLEEP DURATION AND CREATIVE THINKING ON THE REMOTE ASSOCIATES TEST

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Introduction: Short sleep has been shown to affect attention, processing speed, and memory. Creative cognition, including convergent thinking (e.g., identifying remote connections), has received less attention in the sleep literature. In four studies, we examined individual differences in sleep duration relative to performance on a convergent thinking task in which participants view three words (sore-should-sweat) and have to identify a target word that connects them (cold). Based on the literature on sleep deprivation and attention/memory, we hypothesized that short sleepers would show lower convergent thinking performance. By contrast, based on the view that convergent thinking is reflective of fluid intelligence—a higher-order cognitive construct that is resilient to sleep deprivation—short sleep should be unrelated to convergent thinking performance.

Methods: Participants were 551 adults aged 18–30 who were recruited across four experiments. Each experiment compared performance on a traditional 3-item compound Remote Associates Test to performance on a modified approach that provided additional semantic information (4-item Remote-Associates Test). After each experiment, participants were asked to indicate the duration of their previous night of sleep.

Results: Participants performed 27% better on the 4-item version, relative to the traditional 3-item Remote Associates Test ($p < .001$). There were no statistically significant associations between sleep duration and performance accuracy on the 3-item or 4-item compound Remote Associates Tests ($r_s < .10$, $p_s > .05$). This pattern was observed within each experiment, as well as when the data were collapsed across experiments. In addition, there were no significant associations when comparing extreme sleep durations (< 5 hours to ≥ 8 hours; all $p_s > .05$).

Conclusion: Individual differences in recent sleep duration were not related to individual differences in convergent thinking abilities. These findings are consistent with the view of convergent thinking as a marker of fluid intelligence. Experimental work is needed to determine whether convergent thinking is fully resistant to sleep deprivation and to examine generalizability to other creative processes (e.g., divergent thinking, imagination).

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0072

INTENTIONALLY AWAKENING FROM SLEEP AND ITS THERAPEUTIC POTENTIAL TO REDUCE NIGHTMARES

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Introduction: Many people suffer from recurring nightmares that induce fear in their dreams and incur lasting psychological effects. One possible solution to alleviate these nightmares might be to wake up directly from them. Though we typically think of sleep as an “off” state where the sleeper is unable to make decisions, one exception is lucid dreaming. In lucid dreams, the dreamer is aware of the dream and can perform deliberate actions while dreaming. With such control over the dream, it might allow nightmare sufferers to end the nightmare as it is occurring. To date, claims of deliberate awakening from dreams only exist as subjective reports and the actual success rate of such attempts is still unknown. To address this gap in knowledge, the current study tested whether

individuals asked to intentionally wake themselves up during sleep (more specifically, a lucid dream) would do so at higher rates than those asked to perform a control task.

Methods: Participants were asked to either try and wake up from their next lucid dream or clench their fists during their next lucid dream. Both groups completed a survey about their experience upon awakening, including two questions surrounding the impact of the dream task on their awakening.

Results: Relative to participants who clenched their fists while dreaming, participants who attempted to wake up from the dream by closing their eyes reported that the task woke them up more frequently ($p < .05$) and that they woke up sooner after executing the task ($p < .05$). Furthermore, a higher level of lucidity while dreaming was correlated with an earlier wake-up time ($p < .05$).

Conclusion: These results suggest that indeed – contrary to traditional thought – people are able to wake up from sleep intentionally. This new finding might allow individuals to reduce the amount of time they spend in fear during their dreams, which would in turn reduce the psychological and physiological effects of the nightmare. Future research exploring the most effective method of waking up from sleep intentionally could provide new approaches to relieving nightmare-related stress and increasing healthy sleep.

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0073

INVESTIGATING THE EPIGENETIC MECHANISMS UNDERLYING MEMORY CONSOLIDATION DURING SLEEP

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Introduction: It has been established that sleep after learning something (“post-learning sleep”) actively consolidates what was learned. Yet, the underlying cellular and molecular mechanisms are undergoing active investigation. The fear conditioning (FC) memory paradigm, in which an animal learns to associate an environmental cue to an aversive foot shock, has been widely used for memory investigation. While amygdala and hippocampus are two critical sites for processing and storing the FC memory, how the amygdala consolidate this memory during sleep, from both cellular and molecular perspectives, has been little understood, compared to the hippocampus. Moreover, one potential molecular substrate of memory, DNA methylation, has been studied in the hippocampus for its role in learning and memory. Yet it is little known for its memory role in the BLA.

Methods: Here, we used fiber photometry, miniscope calcium imaging, EEG recording, optogenetic manipulation, and whole genome bisulfite sequencing to study the neural mechanisms underlying memory consolidation in the basolateral amygdala (BLA) during sleep.

Results: (1) We found that the BLA neurons display increased activity during REM sleep, compared to that in non-REM (NREM) sleep. (2) Using closed-loop optogenetic strategy, our preliminary results showed that silencing BLA activity during REM sleep leads to memory impairment in contextual fear conditioning task. (3) We compared DNA methylation of BLA neurons at a whole genome level between mice with and without sleep after FC learning and identified differentially methylated regions between them.

Conclusion: Together, our data suggests that the BLA activity during REM sleep is required for consolidation of fear memory, and DNA methylation might mediate this process.

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0074

INVESTIGATING THE IMPACTS OF PHARMACOLOGICAL SLOW-WAVE SLEEP ENHANCEMENT ON COGNITION IN AN ALZHEIMER'S DISEASE MODEL

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Introduction: Alzheimer's disease (AD) is a debilitating and irreversible neurodegenerative disease associated with major disruptions to sleep. Recent works point to a strong bidirectional relationship between loss of slow-wave sleep (SWS), the deepest sleep stage, and the pathological and cognitive features of AD. Here, we investigate the impacts of chronic pharmacological SWS enhancement with gaboxadol, a delta GABAA receptor agonist, on cognitive performance the APP/PS1 mouse model of AD. Currently, we are assessing the impacts of this intervention on Abeta plaque burden.

Methods: Using electroencephalography (EEG), we first assessed if gaboxadol is capable of stimulating SWS sleep in 6-month-old AD mice. Next, 6-month-old control (CTRL) or AD mice received gaboxadol 5x/week for 4 weeks at the start of the light cycle. Groups underwent subsequent testing in the open field (OF), Y-maze, and contextual fear conditioning (CFC) assays (n = 8-9 mice per group). Data were analyzed using two- or three-way ANOVAs, with repeated measures when appropriate.

Results: Our EEG studies demonstrate that gaboxadol (6 mg/kg) significantly enhances SWS/NREM from baseline (p < 0.0308). Gaboxadol did not impact gross locomotor behavior assessed by distance travelled in the in the OF. However, rearing was decreased in AD mice compared to CTRL mice (p < 0.0128). In the Y-maze, gaboxadol significantly increased time spent in the novel arm in CTRL (p < 0.0386) but not AD mice. We did not find significant effects of gaboxadol on memory recall in the CFC assay.

Conclusion: Chronic pharmacological stimulation of SWS using gaboxadol does not show robust cognition-enhancing effects in APP/PS1 mice, but may be cognitively enhancing in CTRL mice. It is possible that longer treatment duration is necessary to rescue cognitive deficits in AD mice.

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0075

MELATONIN IMPAIRS MORNING COGNITION IN HEALTHY YOUNG ADULTS WITHOUT ANY BENEFIT TO SLEEP

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Introduction: Exogenous melatonin has been shown to improve sleep in individuals with sleep disorders, such as insomnia and delayed sleep phase disorder. However, research on the effect of exogenous melatonin on sleep in healthy young adults is

limited. Additionally, there is some evidence that melatonin can negatively affect cognitive processes, such as long-term memory, working memory, and attention. Therefore, we assessed the effect of melatonin supplementation on nocturnal sleep and morning cognition in healthy undergraduates.

Methods: In the evening, participants (N = 120) completed three cognitive tasks: the Psychomotor Vigilance Task (PVT; a measure of attention), UNRAVEL (a measure of procedural placekeeping), and the Paired Associates Learning (PAL) test (a measure of long-term memory). We then asked participants to take a pill under double-blind conditions that contained either melatonin or placebo. Afterwards, participants received an 8-hour sleep opportunity monitored with polysomnography (PSG). One hour after waking, participants completed PAL, UNRAVEL, and PVT again.

Results: We compared morning cognitive performance across the melatonin and placebo conditions, with evening performance as a covariate. Interestingly, melatonin participants had more placekeeping errors than placebo. However, melatonin did not affect PVT or PAL performance. We found no significant differences between the melatonin and sleep groups on any of our sleep measures.

Conclusion: The results suggest that negative performance effects of exogenous melatonin may outweigh any benefits for healthy young adults, particularly when cognitive performance is measured shortly after the sleep opportunity. Our results also suggest that sleep factors captured by PSG may not accurately predict next-day cognitive performance, and that researchers should consider additional factors, such as melatonin concentration, when assessing the relationship between sleep and performance.

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0076

RESILIENCE TO ACUTE SLEEP LOSS WHEN LEARNING ORGANIC CHEMISTRY

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Introduction: Short sleep is often associated with worse academic outcomes, but it remains unknown whether this relationship is causal. In addition, many students perceive that cutting back on sleep is necessary for successful performance in rigorous and intimidating courses, such as organic chemistry. In the current work, we experimentally tested whether acute sleep restriction affected organic chemistry learning outcomes.

Methods: Participants were 60 undergraduate students who had not previously taken organic chemistry. They maintained a sleep diary for seven days and then completed an overnight session that included polysomnography (PSG) monitoring. Participants were randomly assigned to go to bed at either 10:30pm (normal sleep) or 1:30am (sleep restriction). The next morning, all participants were woken up at approximately 7am and completed a virtual lecture on organic chemistry. In one segment, the lecture was self-paced; in the other segment, the lecture was set to advance automatically at a speeded pace. Following the lecture, participants completed a 50-item test over the studied material.

Results: The conditions were similar in age, gender, race/ethnicity, chemistry intimidation, chronotype, prior sleep, and fluid intelligence ($ps > .30$). The bedtime manipulation successfully decreased total sleep time from 454.10 (47.90) minutes to 300.93 (37.23) minutes ($p < .001$), by decreasing time spent in REM and N2 ($ps < .01$; no changes to N1 or N3, $ps > .05$). Sleep restriction significantly altered stress levels during the test ($p < .05$), but not test performance ($p > .10$). Organic chemistry test performance was lower after a speeded lecture than a self-paced lecture, $F(1, 57) = 15.649$, $p < .001$, though this pattern did not interact with sleep condition ($ps > .10$). Students who were more intimidated by chemistry (at baseline) performed more poorly on the speeded section ($r = -.36$, $p < .01$), but just as well on the self-paced section ($r = -.09$, $p = .51$), and these patterns were not moderated by sleep duration.

Conclusion: Students who are intimidated by organic chemistry learning can overcome these barriers via self-paced learning, even when they have been acutely sleep restricted.

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0077

SLEEP AND IMAGINATION: POOR SLEEP QUALITY IS ASSOCIATED WITH MORE COMPLEX AND MORE GOAL-DIRECTED IMAGINATIONS

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Introduction: The relationship between sleep and creativity is complex. Typically, better sleep quality and greater sleep quantity is associated with better cognitive functioning. Despite this general rule, people who demonstrate higher than average levels of creativity are more likely to report worse sleep quality and more insomnia symptoms. The current work investigated sleep health in relation to precursors to creativity: imagination frequency, emotion, complexity, and goal-directedness.

Methods: Two hundred and thirty-seven undergraduate student participants completed demographic questionnaires and self-report measures of imagination (Four-Factor Imagination Scale), sleep (Pittsburgh Sleep Quality Index), and insomnia symptoms (Insomnia Severity Index; Ford Insomnia Response to Stress Test).

Results: Individuals with low sleep quality/quantity, higher insomnia severity, and higher levels of sleep reactivity were those with the most complex imaginations (i.e., imaginations that are rich in details). These associations were generally stronger in female participants than male participants. Furthermore, individuals with higher sleep reactivity also demonstrated more goal-directed imagination (e.g., daydreams have clear goals/outcomes, involve planning the future). Frequency and emotional valence of imaginations were unrelated to sleep measures.

Conclusion: Individuals, and particularly females, with more complex and goal-directed imaginations were more likely to experience worse sleep quality. These findings aligned with the theoretical view that diminished inhibitory control (resulting from poor sleep) can benefit some aspects of creative thinking. Experimental work is needed to determine the causal direction of sleep—imagination associations.

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0078

SUBJECTIVE BUT NOT OBJECTIVE SLEEP PREDICTS MORNING MOTIVATION TO COMPLETE MORE DIFFICULT TASKS

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Introduction: Sleep deprivation impairs many facets of behavior, including performance at tasks. People may perform less efficiently at tasks due to impairments to cognitive processes like working memory following sleep deprivation. However, research shows that compensatory activity occurs when participants are sleep deprived and are faced with difficult tasks (Horne & Pettitt, 1985). This study explored participants' capability and motivation of completing tasks of varying difficulties.

Methods: These data come from a larger study investigating bedroom environment, sleep, and cognition. In this study participants were given an actigraph wgt3x and were told to sleep as they normally would for three-day period. Each morning, participants took a brief survey and cognitive battery shortly after waking. In the survey, participants self-reported their sleep quality from the previous night using a modified version of the sleep disturbance subscale from the Medical Outcomes Survey (Hays et al., 2005). Additionally, a modified version of the Math Effort Task (MET; Engle Friedman et al., 2003) was used. Participants chose a difficulty and completed six simple addition problems without aid of a calculator or scratch paper. Data were cleaned and analyzed using generalized linear mixed effect modeling in SPSS 28.

Results: Two models were run to examine performance (accuracy) and difficulty choice on the MET. In our model predicting performance there were no significant predictors. In our model predicting the choice of difficulty, participants of more socially advantaged populations and those who reported better subjective sleep quality chose to complete harder problems ($b = -.05$, $p = .01$). No significant findings were observed between objective measures of sleep such as sleep efficiency and duration with difficulty chosen or performance.

Conclusion: Motivation to complete more difficult tasks may be related to the quality of sleep one receives during the previous night. The observed lack of difference in performance based on sleep suggest that when given simple problems, sleep deprivation does not impair cognitive performance or that people can compensate for poor sleep when the task is easy. Future studies should continue to explore the relationship between sleep and motivation.

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0079

SUBJECTIVE-OBJECTIVE SLEEP DISCREPANCY IN OLDER ADULTS: DOES COGNITIVE FUNCTIONING MATTER?

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Introduction: Differences between subjective and objective sleep [subjective-objective sleep discrepancy (SOSD)] is prevalent in insomnia and older adults. Despite associations between cognition and sleep parameters, the impact of cognitive functioning on SOSD is unclear. We examined associations between various cognitive domains and SOSD in older adults and whether insomnia status moderates these associations.

Methods: Older adults with (N=47, Mage=68.85, 66% women) and without (N=32, Mage=67.41, 78% women) insomnia [met DSM-5 criteria plus reported >30 mins sleep onset latency (SOL) and/or wake time after sleep onset (WASO) on 3+ nights/7] completed measures of subjective sleep (7-days of sleep diaries), objective sleep (one-night polysomnography, PSG), and objective cognitive tasks: Dimensional Change Card Sort (executive functioning, EF), List Sorting (working memory, WM), Auditory Verbal Learning Test (episodic memory), Flanker (inhibitory control), Pattern Comparison (processing speed). SOSD direction (average sleep diary variable – PSG variable) was computed. Moderated regressions determined independent and interactive (with insomnia status) associations between cognitive performance and SOSD for SOL, WASO, total sleep time (TST) and sleep efficiency, controlling for age, sex, apnea-hypopnea index, and sleep medication usage.

Results: For insomnia, longer self-reported than PSG TST was associated with better WM ($b=27.90$, $SE=9.05$, $p=.003$), episodic memory ($b=12.83$, $SE=2.77$, $p=.01$), processing speed ($b=9.50$, $SE=2.00$, $p<.01$), and inhibitory control ($b=118.40$, $SE=54.09$, $p=.03$). Similarly for insomnia, better self-reported than PSG sleep efficiency was associated with better WM ($b=5.58$, $SE=2.12$, $p=.01$), episodic memory ($b=2.66$, $SE=1.08$, $p=.02$), and processing speed ($b=2.11$, $SE=0.47$, $p<.01$). For non-insomnia, reports of SOSD were not associated with cognitive functioning ($ps>.05$).

Conclusion: Better diffuse cognitive functioning may be a contributing SOSD mechanism in older adults with insomnia. We speculate that better cognitive functioning may suppress cognitive arousal symptoms that are prevalent in insomnia patients, leading to better self-reported sleep relative to what is objectively measured. Prospective studies examining independent and interactive associations between cognition functioning and arousal, and insomnia on SOSD may inform underlying mechanisms of poor sleep health and the temporal impact on cognition.

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0080

TBI TIME SINCE INJURY: A COMPARISON MODEL BETWEEN SLEEP EFFICIENCY AND NEUROCOGNITIVE PERFORMANCE

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Introduction: MTBI remains on one of the most prevalently reported brain injuries. Previous studies have shown an association between sleep efficiency, performance, and neurocognitive outcome. Reported time-since-injury (TSI) has also shown an association with neurocognitive outcome measures, with some evidence suggesting neurocognitive status is significantly worse at 2 weeks post-injury. Here, we examined differences in self-reported sleep efficiency at various time points since injury among individuals who had sustained an mTBI in the preceding year.

Methods: 190 Participants [71 male, 119 female], age $M=24.48$, $SD=6.80$ (HC, $n=39$) and five mild TBI groups based on time post-injury, 2-weeks (2W, $n=12$), 1-month (1M, $n=30$), 3-months (3M, $n=34$), 6-months (6M, $n=33$), and 12-months (12M, $n=40$) post-injury. Participants completed a cross-sectional study at specific post-injury time points ranging from (2W, 1M, 3M, 6M, 12M). Participants completed comprehensive Repeatable Battery for Neuropsychological Status (RBANS) and were administered the Pittsburgh Sleep Quality Index (PSQI) at the time of assessment. Here we analyzed the sleep efficiency subscale of the PSQI. Separate correlation analysis examined the association between sleep efficiency and the attention index for each TSI group.

Results: The ANOVA showed a main effect of TSI group, $F(5,182) = 2.83$, $p=.017$. Post Hoc comparisons with the LSD test showed that the 12M group had worse sleep efficiency than HC and 2W, 1M, and 3M but did not differ from 6M ($p<.05$). Separate correlations between sleep efficiency and the attention index of the RBANS for each TSI group showed a marginally significant association at 2W ($r(10)=-.467$, $p=.063$, one tailed), and statistically significant at 12M ($r(38)=-.266$, $p=.049$, one tailed), suggesting that worse sleep efficiency was associated with worse attention performance at those time points.

Conclusion: Sleep efficiency differs across the first year of recovery from mTBI. Notably, individuals in the 12M TSI group appear to have worse sleep efficiency than any other TSI group but did not differ from the 6M group. Sleep efficiency appears to be associated with attentional capacity at 2W and 12M timeframes. This suggests that interventions that focus on enhancing sleep in patients with mTBI may prove promising for facilitating recovery.

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0081

THE IMPACT OF SLEEP DEFICIENCY ON SPATIAL WORKING AND LONG-TERM MEMORY IN DIFFERENT RAT MODELS OF SLEEP DEPRIVATION

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Introduction: A pressing issue in modern society, lack of sleep has detrimental health consequences, among which cognitive dysfunctions attract great attention. Although there is consensus about the harmful effects of insufficient sleep on vigilance and attention, there is still a debate about memory susceptibility to

acute and chronic sleep deprivation. Which types of memory are more vulnerable remains unclear. We studied the susceptibility of spatial working and long-term memory to acute and chronic sleep deprivation in rats.

Methods: Male Wistar rats were deprived of sleep (SD) by placing cages on an orbital shaker. Animals were subjected to three patterns of SD: 1) acute SD (ASD) — continuous SD for 18 hours; 2) short sleep restriction (SSR) — cycles of 3-hour SD followed by 1 hour of sleep opportunity over 24 hours, with a total SD duration of 18 hours; 3) chronic sleep restriction (CSR) — SSR for 5 consecutive days. For each SD protocol, working spatial memory was assessed with the spontaneous alternation test in the Y-maze. Learning and long-term spatial memory were assessed in the Barnes maze test.

Results: ASD impaired spatial working memory, as assessed by spontaneous alternations in the Y-maze test, and decreased the level of locomotion/exploration (assessed by the number of arm entries). However, in SSR and CSR, 1-hour alternating sleep opportunities allowed for preventing working memory loss. The Barnes maze test demonstrated no changes in learning or spatial long-term memory under any tested SD conditions.

Conclusion: The results suggest that spatial working memory is the most vulnerable to continuous sleep loss. Even under a 5-day chronic sleep restriction, the negative effect disappears if rats are allowed to sleep during intermittent 1-hour intervals. It indicates the great importance of short sleep intervals that protect memory against sustained sleep restriction. The resilience of long-term memory to any of the tested sleep deprivation conditions implies that short-term and long-term memory systems diverge in their susceptibility to sleep deficiency.

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0082

THE ROLE OF SLEEP DURATION AND DAYTIME SLEEPINESS ON NEUROCOGNITIVE FUNCTIONING

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Introduction: Studies examining the impact of sleep on neurocognitive functioning have broadly found that poor sleep and daytime sleepiness manifest in poorer performance on tasks involving attention, concentration, memory, reasoning and thinking. Given the expansive nature of neurocognition, the current study assessed the role of sleep duration and daytime sleepiness broadly on overall neurocognitive functioning as well as more specifically on executive functioning when controlling for age and gender identity. We hypothesized that both sleep duration and reported daytime sleepiness would be associated with a lower neurocognitive status and poorer executive functioning as observed through computerized assessment.

Methods: Participants included 148 (50.7% male; μ age=34.58) patients who presented to a Neuropsychological practice for the assessment of ADHD through a structured assessment battery. All patients completed a multi-component computerized assessment of overall neurocognitive status (CNS Vital Signs) and pen-and-paper questionnaires targeting the subjective reporting

of sleep duration (Pittsburgh Sleep Quality Index) and daytime sleepiness (Epworth Sleepiness Scale). Two separate multiple regressions were run to determine the association of sleep duration and daytime sleepiness to overall neurocognitive status and executive functioning abilities when controlling for age and gender identity of patients.

Results: The full model demonstrated that when considered together sleep duration and daytime sleepiness significantly aided in the prediction of neurocognitive status, $F(4,143)=3.81$, $p=.006$, $R^2=.096$, and executive functioning abilities, $F(4,143)=3.90$, $p=.005$, $R^2=.098$, of patients when controlling for age and gender identity. Of note, only daytime sleepiness was a statistically significant sleep predictor of both neurocognitive status ($\beta=-.172$, $p=.035$) and executive function ($\beta=-.197$, $p=.016$).

Conclusion: Broadly, these findings suggest that sleep is an important predictor of neurocognitive functioning. Within the clinical field, these results support the inclusion of sleep measurement, whether objective or subjective, during the assessment of neurocognitive functioning to better account for the role played by sleep on patient performance. To this end, it would be beneficial to assess a greater range of sleep factors and how they may be associated with the various neurocognitive domains.

Support (if any):

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0083**LONGITUDINAL SLEEP INSTABILITY IS ASSOCIATED WITH INCREASED MRI-VISIBLE PERIVASCULAR SPACE BURDEN**

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Introduction: Emerging data from our group found longitudinal sleep variability within the Seattle Longitudinal Study was significantly associated with cognitive impairment and predicted cognitive impairment 10-years downstream. While this data supports a link between sleep instability, aging, and cognitive decline, the mechanism linking these processes is unknown. MRI-visible perivascular space (PVS) burden is a putative marker of glymphatic dysfunction, and previous studies suggest that sleep disruption is associated with PVS burden.

Methods: This a secondary analysis of subjects who a) participated in the Seattle Longitudinal Study and b) had T1-weighted 3 T MRI and FLAIR scans available for PVS analysis (n=250). We evaluated the variability (standard deviation) in each participant's longitudinal self-reported sleep duration. White matter MRI-visible PVS were evaluated with a semi-automated segmentation algorithm, accounting PVS total burden (number/cm3), volume (mm3/cm3), as well as average PVS width, length, and median volume across participants, blinded by group. Participants were stratified into low or high-sleep variability groups.

Results: Preliminary analysis (n=37) demonstrated a significant association between high sleep variability and increased whole-brain PVS burden (p=0.04), with low sleep variability participants exhibiting an average of 7 PVS and high sleep variability participants an average of 11.33. Follow-up analysis evaluated PVS features within the wider cohort.

Conclusion: These findings suggest that variability in longitudinal sleep duration may exert a previously unappreciated influence on pathological processes, potentially including glymphatic dysfunction. Future studies within this cohort will seek to evaluate longitudinal changes in PVS burden across longitudinally-collected MRIs. Additional studies should be performed evaluating these findings on an independent cohort to assess whether sleep variability of different time scales (weeks, years, decades) exerts similar effects on these outcomes.

Support (if any):

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0084**NAPPING IN THE MORNING IS ASSOCIATED WITH RISK OF ALZHEIMER'S DEMENTIA IN OLDER ADULTS**

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Introduction: Recent evidence suggests that older adults with more frequent and longer daytime naps have an increased risk of

Alzheimer's dementia (AD). We aim to further elucidate whether the timing of daytime napping impacts AD risk.

Methods: Data were from 1,203 participants in the Rush Memory and Aging Project (mean age at actigraphy=80.85±7.30; 77% female). Each participant wore an accelerometer (Actical) for up to 14 (mean 9.57±1.17) days and have been followed for up to 17 (mean 6.92±4.12) years with annual clinical assessment to determine AD status. We used a validated algorithm to identify daytime nap episodes between 9am-7pm and determined the timing of naps based on the midpoint of each nap. We computed the proportion of naps within each 2-h window for each participant, i.e., morning (9-11am), noon (11am-1pm), early afternoon (1-3pm), late afternoon (3-5pm), and early evening (5-7pm). Cox proportional hazards models were performed to examine the associations of napping timing with risk of AD, with adjustment for age, sex, education years, and nighttime sleep duration.

Results: Among all participants, 357 (30%) developed AD during the follow-up (mean time to AD: 6.34±3.98 years). Taking all naps in the morning, compared to taking all naps at other times, is associated with a 1.9-fold increased AD risk (HR [95%CI]=1.93[1.002-3.58], p=0.04). This association was only observed in women (HR=2.22[1.08-4.38], p=0.03) but not in men (HR=1.01[0.18-4.38], p=0.99). Moreover, the association between naps in the morning and AD risk was attenuated when additionally adjusted for total nap duration and frequency, BMI, and intradaily variability in rhythms (HR=1.71[0.85-3.43], p=0.13). The proportions of naps during other times of the day were not associated with AD risk (noon: HR=1.02[0.44-2.23]; early afternoon: HR=1.28[0.72-2.22]; late afternoon: HR=0.62[0.33-1.15]; early evening: HR=0.62[0.30-1.25]; ps>0.05).

Conclusion: More naps in the morning were associated with an elevated risk of developing AD in older adults. A higher propensity of napping in the morning may be an indicator of disturbances in sleep-wake regulation. Future studies are warranted to test whether interventions to consolidate nap timing or limit napping in the morning can improve neurocognitive outcomes.

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0085**PERIPHERAL GLUCOSE METABOLISM BIDIRECTIONALLY MODULATES SLEEP IN A MODEL OF ALZHEIMER'S DISEASE**

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Introduction: Metabolic impairments and sleep disruptions are both recognized as modifiable risk factors in the development of Alzheimer's disease (AD). A bidirectional relationship exists between sleep and AD where pathology can disrupt sleep, but sleep disturbances can also increase AD-related pathology. This results in a feed-forward cycle of disease progression and further sleep impairments. Sleep fragmentation and poor sleep quality can also cause glucose intolerance and insulin resistance. However, it remains unclear if peripheral metabolic dysfunction alone can impair sleep, particularly in the context of AD-related pathology. Therefore, the goal of this study was to establish mechanisms connecting peripheral metabolic and sleep

disruptions and identify potential therapeutic targets for mitigating AD risk.

Methods: We implanted biosensors measuring interstitial fluid (ISF) levels of glucose and lactate, biomarkers of cerebral metabolism and neuronal activity, respectively, directly into the hippocampus of wildtype and APP/PS1 mice, a model of amyloid-beta ($A\beta$) overexpression. Biosensors were paired with cortical EEG and EMG recordings for simultaneous sleep/wake analysis. To understand the relationship between metabolic dysfunction and sleep, we altered the peripheral metabolic environment using two paradigms: an acute high-fat, high-sugar diet (HF/HSD) and a pharmacological metabolic rescue.

Results: We found short-term HF/HSD exposure was sufficient to disrupt ISF glucose and lactate diurnal rhythms, independent of changes to pathology burden. Moreover, we found significant sleep disruptions, particularly decreased delta power, indicating slow wave sleep impairments. These findings were exacerbated in mice with $A\beta$ pathology who have disrupted metabolic and sleep functioning at baseline. Conversely, we found normalizing peripheral glucose tolerance in mice with $A\beta$ pathology was sufficient to rescue impaired ISF glucose and lactate rhythms. We also saw a restoration of normal sleep-wake patterns, specifically within slow wave activity.

Conclusion: We found modulating peripheral glucose metabolism can bidirectionally alter sleep, particularly slow wave sleep, independent of changes in $A\beta$ burden. This indicates sleep as a mediator in the relationship between metabolic impairments and AD pathophysiology. While impaired sleep increases AD risk, improved sleep slows pathology accumulation. Therefore, this study demonstrates targeting peripheral glucose regulation is a potential avenue for early AD intervention and risk mitigation.

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0086

GOOD QUALITY SLEEP FACILITATES PSYCHOMOTOR LEARNING VIA FAST SPINDLES AMONG OLDER ADULTS

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Introduction: Sleep spindles are neural oscillations of frequency between 11 to 16 Hz during non rapid eye movement sleep. They are coordinated with hippocampal ripples and slow oscillations to facilitate memory consolidation by modulating synaptic plasticity. Fast spindles, predominant in central and parietal derivations of EEG during Stage 2 NREM sleep, are associated with overnight visuomotor skills enhancement, especially in the later part of the night. The relationship between fast and slow spindles during sleep and psychomotor ability has not been characterized well, particularly in older adults. The objective of this study was to study the relationship between sleep microstructure during various stages of sleep and cognition in good and poor sleepers.

Methods: This is a cross sectional observational study conducted on 16 male participants (age 63.6 ± 5.22 years). Good ($n=9$) and poor sleepers ($n=7$) were classified on the basis of PSQI score (≤ 5 is good). Overnight polysomnography was done and ICMR-NCTB battery was administered for assessment of cognition. In DOMINO software, after visual artifact

removal, spindles were analyzed by selecting 11 - 12.99 Hz (slow) in F4, and 13 - 16 Hz (fast) in C2. Statistical analysis was done using GraphPad prism (v 9.4.1).

Results: Fast spindle index in N2 (good sleeper: $r = -0.850$, $p = 0.006$; poor sleeper: $r = 0.398$, $p = 0.466$), fast spindle density in N2 (good sleeper: $r = -0.870$, $p = 0.004$; poor sleeper: $r = -0.331$, $p = 0.468$), total fast spindle number during deep sleep (good sleeper: $r = -0.600$, $p = 0.031$; poor sleeper: $r = -0.244$, $p = 0.599$), and total slow spindle density (good sleeper: $r = -0.833$, $p = 0.025$; poor sleeper: $r = -0.080$, $p = 0.865$) were found to be negatively correlated with psychomotor ability assessed by trail making test.

Conclusion: Among older adults, good sleepers, as compared to poor sleepers overall have a higher fast spindle index and density during N2 sleep and there is significant correlation with better psychomotor ability.

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0087

ASSOCIATIONS BETWEEN AHA'S LIFE'S ESSENTIAL 8 AND COGNITION IN A SAMPLE OF DIVERSE MIDLIFE ADULTS

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Introduction: Life's Simple 7 (LS7), originally proposed as the seven most important predictors of heart health, is associated with negative cognitive outcomes. Recently an updated Life's Essential 8 (LE8) added sleep as the new eighth component. However, limited research has investigated LE8 and cognitive outcomes. We hypothesize that a higher composite LE8 score will be associated with better cognitive performance.

Methods: Cross-sectional analyses were conducted including 1498 adults (36-76 years old, 41% male, 61% African American) from the Healthy Aging in Neighborhoods of Diversity Across the Life Span (HANDLS) study who completed all LE8 and global cognition measurements in wave 4 data collection (2013-2017). Blood pressure, glucose, cholesterol, BMI, diet, physical activity, and smoking were calculated based on available wave 4 data per LE8 scoring guidance. The sleep component was scored based on the sleep duration question from the Pittsburgh Sleep Quality Index ("During the past month, how many hours of actual sleep did you get at night?"). LE8 score was calculated by averaging the scores from the eight components. Cognitive performance was measured from a Joggle battery to calculate a total global cognition score and individual domains (memory, attention, visual orientation, executive function, speed). A set of linear regression analyses were performed. Covariates included biological age, sex, race, poverty status, sleep apnea, education attainment (high school), reading literacy, and depression (CES-D).

Results: Higher scores on LE8 were significantly associated with better global cognitive performance, even after adjusting for covariates ($b=0.024$, $p = .014$). Among all cognitive domains, higher LE8 scores were significantly associated with better memory ($b = 0.011$, $p < .001$), attention ($b=0.012$, $p = .007$), but not visual orientation, executive function, or speed.

Conclusion: Better cardiovascular health, as indicated by a higher LE8 composite score, is associated with better cognitive performance among U.S. middle-aged and older adults. Future studies may further explore this relationship using longitudinal data and explore the predictive power of each LE8 component.

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0088

BIDIRECTIONAL PATHWAYS LINKING DAILY PARTNER INTERACTIONS TO SLEEP QUALITY IN OLDER ADULT COUPLES

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Introduction: Decreasing sleep quality is a challenge for older adults over age 65. Researchers have found significant associations between romantic relationships and sleep quality. However, most existing studies are cross-sectional; few have focused on the aging population who experience the most sleep problems; few have considered mechanisms linking close relationships and sleep quality; few have considered the specific effects of social interactions on sleep quality; and few have considered bidirectional relationships. To address these gaps in the literature, this study investigated the bidirectional pathways linking daily partner interactions to sleep quality in older adult couples. This study also tested daily negative affect, positive affect, and perceived partner responsiveness as three possible mediators explaining recursive associations between daily partner interactions and sleep quality.

Methods: This study recruited 238 older adult couples to complete baseline questionnaires including assessments of attachment orientation and demographics. Couple members also completed daily diaries for 7 consecutive days, reporting on their daily relationship, emotional, and sleep experiences.

Results: Results supported the predicted bidirectional relationship between daily partner interactions and sleep quality via three hypothesized pathways (i.e., negative affect, positive affect, and perceived partner responsiveness). Specifically, older adults who reported higher than average negative partner interactions during the day reported increases in negative affect, and decreases in positive affect and perceived partner responsiveness on the same day, which in turn were associated with worse sleep quality that night. The opposite was true for positive partner interactions. Bidirectionally, older adults who reported higher than average sleep quality on one night reported decreases in negative affect and increases in positive affect and perceived partner responsiveness the next day, which in turn were associated with fewer negative partner interactions and more positive partner interactions that day. Results also revealed moderating effects of attachment orientation and gender.

Conclusion: In conclusion, this study contributes to a sparse literature assessing the bidirectional relationship between daily partner interactions and sleep quality in the aging population. This research adds to our knowledge of the mechanisms underlying the recursive relationship and informs us of potential avenues for relationship-based interventions aimed at improving sleep quality.

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0089

CHRONIC SLEEP DISRUPTION INCREASES AMYLOID BETA DEPOSITION AND GLIOSIS IN THE 5xFAD MOUSE MODEL.

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Introduction: Recent studies have found that mid-life sleep disruption is associated with the development of Alzheimer's disease-related neuropathology, including the deposition of amyloid beta. Yet, the mechanism connecting sleep disruption, particularly over chronic timescales, and downstream Alzheimer's pathology remains unclear.

Methods: In this study, we evaluated the impact chronic sleep disruption has on the development of neuroinflammation and amyloid beta plaques in the 5xFAD amyloidosis mouse model. Chronic sleep disruption in male and female C57BL/6 and 5xFAD+ mice was performed in Lafayette sleep fragmentation cages from 10-18 weeks of age. Glymphatic function was assessed by measuring the influx of fluorescent cerebrospinal fluid tracers into brain tissue. Aquaporin-4 localization, amyloid-beta plaque deposition, and markers of astroglial and microglial activation were assessed by immunofluorescence.

Results: We observed that chronic sleep disruption increased neuropathological outcomes in 5xFAD+ and littermate controls. This was evident in significantly increased amyloid-beta plaque deposition and significantly increased gliosis, indicated by increases in both astrocyte (GFAP) and microglial (Iba1) expression. The impact on glymphatic function, evaluated through both cerebrospinal fluid tracer distribution and assessment of aquaporin-4 mislocalization, was assessed in parallel and correlated with neuropathological outcomes.

Conclusion: These findings highlight the critical association between dysfunctional sleep and the development of Alzheimer's-related amyloid beta pathology. They indicate that there is an interaction between chronic sleep disruption, neuroinflammation, and amyloid β deposition.

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0090

SLEEP ARCHITECTURE ASSOCIATIONS WITH BRAIN AGE: A MULTI-SITE MODEL VALIDATION

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Introduction: Machine Learning (ML) can draw upon complex patient data to predict current and future health status, but the best performing ML models are often difficult to interpret. One such ML-defined health marker is the brain age index (BAI), the difference between ML-predicted age and chronological age (CA) using electroencephalogram (EEG) during sleep. BAI is associated with multiple disease states including increased risk

for all-cause mortality. Still, validation of published models has been limited, and the underlying associations between polysomnography sleep architecture metrics and BAI estimation are not well understood.

Methods: A deep neural network (DNN) model was trained to predict the brain age (BA) of patients using raw EEG signals recorded during clinical polysomnography (PSG). The DNN was trained on N=54,000 PSGs. The model was then validated on two independent datasets: a Kaiser Permanente (KP) Historical PSG Dataset (N=10,694), and a multi-site retrospective PSG dataset (N=15,158). To test association with BAI, ordinary least squares (OLS) regression was performed on these validation datasets using basic features derived from sleep staging architecture and arousal data.

Results: In the validation datasets, we observed mean absolute error (MAE) of 6.67 (6.69/6.49 F/M, KP dataset) and 5.65 (5.56/5.44 F/M, independent dataset). In the OLS analysis, consistent, negative associations were detected between both N3 and REM sleep percentage vs. BAI. Furthermore, BAI was consistently positively associated with N1 sleep percentage. Each of these effects was significant at $p < 0.001$.

Conclusion: This study builds upon and expands prior research by evaluating large multi-site datasets and assessing the relationship of N3/REM sleep duration with the predicted brain age. Using a DNN model, BAI was associated with significantly increased N1 and concomitant decreased N3/REM. Further research is needed to determine if BA is malleable and potentially reduced with clinical intervention and positive changes in lifestyle and wellness-related behavior.

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0091

THE ASSOCIATION BETWEEN SLEEP HEALTH FACETS AND INFLAMMATORY MARKERS: RESULTS FROM THE EINSTEIN AGING STUDY

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Introduction: Prior research assessing self-reported or nocturnal sleep suggested that specific sleep traits (sleep restriction in the laboratory; poor sleep quality, sleep disorders) are associated with both pro and anti-inflammatory cytokine and C-Reactive Protein (CRP) levels. To extend prior research, we investigated associations between multiple dimensions of objectively assessed sleep health with both circulating and stimulated inflammatory markers in a diverse sample of older adults.

Methods: Participants in the Einstein Aging Study (EAS) were included (N=218, Mage=77.5 years, 6% female; 46% White, 38% Black, 14% Hispanic/other). A confirmatory factor analysis using wrist actigraphy sleep variables over 16 days yielded 6-component multi-dimensional sleep health facets: Regularity, Alertness/Sleepiness (daytime), Timing, Efficiency, Duration, and Rhythmicity. Inflammatory markers collected in the morning included CRP and both circulating markers reflecting current systemic inflammation, and lipopolysaccharide (LPS)-stimulated levels of (IL-1 β ,

IL-4, IL-6, IL-8, IL-10, TNF α), which reflect responses to an inflammatory challenge, an index of immune reactivity. Associations between each inflammatory marker and each sleep health facet were examined using linear regression, controlling for BMI, gender, age, education, ethnicity/race, number of health conditions, nocturnal hypoxemia, Oxygen Desaturation Index (ODI) ≥ 15 .

Results: Participants with more daytime sleepiness (i.e., higher number and longer duration of naps and lower activity level) had higher circulating IL-6 and CRP levels. Lower sleep efficiency was associated with lower levels of the anti-inflammatory circulating cytokine IL-4 and higher levels of stimulated IL-8 and TNF α . Longer sleep duration was associated with higher levels of circulating IL-1 β and CRP. Less rhythmicity across days was associated with higher levels of circulating IL-6. Nocturnal hypoxemia was associated with higher levels of CRP and stimulated IL-4, IL-8, and TNF α . We found no association between sleep timing and regularity and any inflammatory marker.

Conclusion: We observed that various sleep health facets are related to markers of inflammation and immune reactivity in older adults. This research also demonstrates the value of using 24-hour, device-based estimates of different sleep health facets relevant for immune function. Associations between 24-h sleep and inflammation are particularly important for older adults, who evidence more daytime sleepiness and less rhythmic sleep/active patterns in daily life.

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0092

BARRIERS AND FACILITATORS OF SLEEP HEALTH IN FAMILY CAREGIVERS OF PERSONS LIVING WITH DEMENTIA: A QUALITATIVE STUDY

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Introduction: Family caregivers of persons with dementia (PLwD) commonly report poor sleep health. Existing effects of sleep interventions are mixed and may not have addressed unique issues experienced by caregivers of PLwD. Understanding the barriers and facilitators to get a good night's sleep for these caregivers is imperative for developing acceptable and effective interventions to improve sleep health in this population.

Methods: This was a secondary data analysis that used a qualitative descriptive design and aimed to explore sleep characteristics and experiences in family caregivers of PLwD. The current study used the same study design to explore barriers and facilitators of good sleep. Using a semi-structured interview, 19 family caregivers of PLwD who provided unpaid caregiving > 4 hours a day with insomnia symptoms (Insomnia Severity Index > 5) participated in this study. Interviews were audio-recorded and transcribed verbatim. Codes and themes were identified.

Results: Caregivers, on average, were 64 years old and primarily female (57.9%), Caucasian (68.4%), and spouses (78.9%). In general, caregivers of PLwD reported that the caregiving role negatively influenced and changed their sleep. Themes associated with barriers to good sleep included 1) PLwD's sleep problems, including a need for

increased vigilance for the PLwD, 2) stress associated with balancing work and family responsibilities with caregiving, and 3) caregiver's sleep problems, such as the use of CPAP, having a history of sleep problems before the caregiving role, and changes of sleep patterns with aging. Participating in regular exercise and practicing mindfulness activities (e.g., breathing, meditation or yoga) were themes associated with facilitators of good sleep. Maintaining good sleep hygiene habits (e.g., no caffeine and no daytime naps) and avoiding bad sleep hygiene habits (e.g., watching TV in the bedroom or using an electronic device in bed) were also identified as facilitators of good sleep.

Conclusion: Caregivers of PLwD reported poor sleep but identified multiple modifiable factors that could be used for interventions to improve sleep. These interventions can be at individual, dyadic, or family levels to best impact caregivers' sleep.

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0093

CHRONOTYPIC CHARACTERISTICS OF SLEEP, MENTAL HEALTH, AND DAILY LIFE OF JAPANESE UNIVERSITY OF HEALTH SCIENCES STUDENTS

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Introduction: Students' lifestyles change after entering the university negatively impacting effective sleep regulation, daytime alertness, motivation to learn, and mental health. An evening chronotype has been increasingly associated with negative impacts upon performance and well-being. Greater understanding of chronotype differences in sleep-related, mental health, and daily life characteristics is needed to develop a sleep health promoting intervention.

Methods: Cross-sectional descriptive design among health sciences students (nursing, occupational therapy and physical therapy) in a Japanese university. The Japanese version of the Morningness-Eveningness Questionnaire (MEQ-J) was used to create morning (M), intermediate (I), and evening (E) chronotype groups. One-way analysis of variance was used to investigate differences among chronotype groups by sleep, mental health, and daily life characteristics. We assessed insomnia severity (ISI-J), sleep quality (PSQI-J), sleep hygiene (SHPS-J), daytime sleepiness and dysfunctional sleep beliefs; depression (JCES-D) and anxiety; and time use in club, commuting, sleep, and work, as well as engagement in meaningful day-to-day activities (EMAS-J), significant group differences were explored post-hoc.

Results: Of 369 students there were 21% classified as M chronotype, 63% as I, and 16 % as E; an approximate 1:3:1 ratio. Sleep quality was progressively better as chronotype advanced from E, to I, to M (PSQI-J: d range 0.41-1.07); along with sleep problems being less likely (ISI-J: d range 0.45-1.16). Sleep hygiene practices were most effective for the M chronotype, followed by I then E (SHPS-J: d range 0.49-1.14). No

group differences were found in daytime sleepiness or dysfunctional sleep beliefs. Depression symptoms were greater in the E chronotype compared to I and M (JCES-D: d range 0.52-0.84). M chronotypes reported the longest commuting times (d range 0.45-0.55). No differences were found in sleep duration or time spent in other activity types. Lastly, M chronotypes reported engaging in more meaningful activities compared to E (EMAS-J: d = 0.47).

Conclusion: Sleep health lifestyle intervention should target chronotype preference to be less evening-like, thereby promoting sleep quality and mental health. Intervention could tailor sleep hygiene beliefs and skills to address sleep timing, pre-sleep arousal and environment regulation according to individuals' daily life characteristics and chronotype differences.

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0094

EFFECTS OF ROCKING-INDUCED SLEEP ENHANCEMENT ON WILD TYPE (WT) AND APPXPS1 KNOCK-IN (KI) ALZHEIMER'S DISEASE (AD) MICE

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Introduction: Passive rhythmic movement—rocking—is found to enhance sleep, particularly in infants and young wild type (WT) mice. Rocking can potentially enhance sleep at all ages, with the added benefit of being non-invasive, easy to translate for human use, and with negligible side effects. Furthermore, sleep enhancement tools should be especially valuable to patients with sleep disturbances, a pervasive feature of age-related dementia including Alzheimer's disease (AD). However, rocking has not been explored widely as a means of sleep enhancement. Therefore, our study explores the impact of rocking on sleep architecture in both WT and APP/PS1 KI mice (a model of human AD).

Methods: Male C57BL/6J (WT; n=3) and APPxPS1 KI (AD; n=4) mice (10-12 months old) were kept under a 12h:12h light/dark cycle with access to food and water ad libitum. A reciprocating platform was used to laterally rock individually housed mice at 1 Hz, a rate previously shown to enhance sleep in younger mice, for nine hours during the light period. The experimental protocol consisted of a baseline day, rocking day, and a post-rocking day, with the mice being rocked only during the rocking day for nine hours. EEG/EMG signals were recorded on baseline, rocking, and post-rocking days. Vigilance states (wake, NREM, REM) were scored in 4-second epochs from the EEG/EMG data using standard criteria. Mean bout duration (MBD) and time spent in each vigilance state were estimated and compared for both AD and WT mice.

Results: In repeated tests (>6 trials per mouse), we observed a significant increase in the NREM (p< 0.001) and decrease in REM (p< 0.05) sleep percent on the rocking versus the non-rocking days in AD but not in WT mice. Additionally, NREM MBD (p< 0.05) significantly increased, and REM

MBD ($p < 0.05$) decreased on rocking versus non-rocking days, only in AD mice.

Conclusion: Our results suggest that rocking can be a potential tool for sleep enhancement in AD mouse models; investigations on a larger sample are in progress. Future studies will focus on the impact of rocking on cognitive impairment and AD neuropathology, which are linked to sleep disruption.

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0095

MAGNITUDE OF TEMPERATURE DROP PRIOR TO SLEEP ONSET MAY PREDICT INCREASE IN SLOW WAVE SLEEP

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Introduction: Neural circuitry implicated in thermoregulation is known to be interdependent with that implicated in regulation of sleep-wake state. In addition, previous studies in both rodent and human have shown that the sleep-associated decline in core body temperature (CBT) is associated with subsequent slow wave sleep. We sought to replicate this association in cognitively normal older adults, and extend upon previous studies by using automated telemetric methods to measure CBT.

Methods: Thirty-one cognitively normal and mildly cognitively impaired (MCI) older adults (age 68 ± 6 years, 18 female, 3 MCI) underwent measurement of CBT for two consecutive nights with a telemetric sensor, during which lab nocturnal polysomnography was simultaneously performed. Data from the second night were used. A validated algorithm was used to preprocess CBT to exclude and fill artifactual data outliers and small gaps, respectively. The sleep-associated CBT was calculated with an automated procedure by identifying the CBT decrease between the first peak in CBT identified prior to 'Lights Out' and the lowest value following Lights Out. Slow wave activity (SWA) increase was calculated as increase relative to baseline in the relative spectral power (0.5-4.0 Hz, F3-M2) in the first 5 second epoch following lights out.

Results: Of the 31 participants, 21 had both good quality EEG and CBT data, with an average total sleep time of 7.5 ± 1.5 hours, and an average duration 46.6 ± 18.5 hours of CBT data collected. There was a strong positive correlation between the magnitude of CBT decline and subsequent SWA ($\rho = 0.70$, $p < 0.001$ Spearman's Rank correlation), supporting previous results.

Conclusion: This is one of the first studies to obtain simultaneous CBT and NPSG data in older adults using an ingestible telemetric sensor. Our results support the previous research that there is a significant relationship between sleep-associated body cooling prior to sleep onset and increase in SWA. This highlights the potential for future therapeutic thermal intervention in older adults to improve sleep and sleep mediated health conditions. Further research with a bigger sample size will be necessary to control for variables such as obstructive sleep apnea and cognition status.

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0096

SHORT SLEEP DURATION AND POOR SLEEP QUALITY ASSOCIATED WITH ELEVATED SERUM NFL AND MILD COGNITIVE IMPAIRMENT IN OLDER VETERANS

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Introduction: Ten percent of adults aged ≥ 65 and 50% of adults ≥ 85 years exhibit cognitive impairment. In addition, 50% of older adults experience poor sleep quality. Veterans are more vulnerable to sleep disturbances and potential cognitive impairment as long-term consequences of on-duty responsibilities, co-morbidities, and conditions such as post-traumatic stress disorder. Previous studies demonstrated a relationship between sleep and cognitive impairment through impaired glymphatic function and neurodegeneration. Biomarkers such as neurofilament light (NfL) are elevated in neurodegeneration and dementia. Here, we sought to investigate NfL levels in cognitive-intact older Veterans exhibiting poor sleep quality.

Methods: A cross-sectional study with eighteen Veterans aged 65-86 without a clinical diagnosis of dementia. Self-reported sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI), while time in bed (TIB), and total sleep time (TST) were retrieved from Fitbit Charge. Cognitive function was evaluated with the St. Louis University Mental Status Exam (VA-SLUMS). We used an automated multiplex immunoassay system to identify dementia biomarkers using an enzyme-linked lectin assay. T-tests, one-way or two-way ANOVAs with Tukey's post-hoc (with or without repeated measures) were used for the analysis.

Results: Participants were classified as good sleepers (PSQI > 5) and poor sleepers (PSQI < 5). Poor sleepers spent less TIB (Fitbit 5.3h vs. 7.7h, $p = 0.001$) and slept fewer hours (Fitbit 4.7h vs. 7.2h, $p = 0.001$) when compared to good sleepers. Additionally, poor sleepers exhibited mild cognitive impairment (VA SLUMS 26.9, $p = 0.01$). Lastly, poor sleepers exhibited higher serum NfL (mean 66.7, $p = 0.04$).

Conclusion: Poor sleep quality was associated with short sleep duration, mild cognitive impairment, and higher serum levels of NfL in older Veterans without a dementia diagnosis. Results may contribute to the early identification of dementia and sleep-centered treatment guidance. Further studies with more extensive and diverse samples are warranted before clinical recommendations.

Support (if any): Carleara Weiss, Ph.D., MS, RN. 1K99AG079117-01 (PI), National Institute on Aging.

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0097

SLEEP AND EATING RHYTHMS ARE ASSOCIATED WITH METABOLIC RISK IN POSTMENOPAUSAL WOMEN

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Introduction: Postmenopausal women are particularly vulnerable to metabolic dysfunction. Compelling evidence suggests that this is due to their lacking the protective effect of estrogens. We have shown that circulating estrogens regulate daily eating and sleep-activity rhythms in female mice and protect them from obesity and diabetes. However, few studies have investigated whether postmenopausal women have disrupted eating and

sleep-activity rhythms that could contribute to their metabolic dysfunction. The purpose of this study was to investigate the relationship between eating rhythms, sleep, and metabolic risk in postmenopausal women.

Methods: During 7 days, we studied sedentary, postmenopausal women who were not taking hormones (estrogens $\pm$ progestin) and were metabolically unhealthy, defined as prediabetic or normal glucose tolerance with at least 1 feature of the metabolic syndrome. Women taking medications affecting sleep or eating were excluded. Sleep timing and quality were assessed by actigraphy and sleep logs. Times of first and last meals were collected from participants with a texting system. Body composition (DXA), body mass index (BMI), and waist circumference were collected as markers of obesity. Lipid metabolism and glycemic control were assessed by fasting lipid panel and HbA1c as well as oral glucose tolerance test.

Results: Eighteen postmenopausal women (mean $\pm$ SEM; 57.2 $\pm$ 1.1 years) participated in the study. Both sleep timing and quality were associated with metabolic risk in postmenopausal women. Specifically, later timing of sleep onset was associated with later meal timing and greater BMI and body fat percentage. Increased sleep fragmentation was associated with reduced HDL. In addition, both the timing and duration of eating were associated with worse metabolic measures. Longer eating duration was associated with larger waist circumference. Later eating time was associated with greater waist circumference and BMI.

Conclusion: We found that late timing and poor quality of sleep, as well as long eating duration, are associated with markers of metabolic risk in postmenopausal women. These data suggest that interventions that reduce eating duration and advance the timing of last meal and sleep onset may improve metabolic risk in postmenopausal women.

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0098

PRENATAL MATERNAL SLEEP QUALITY PREDICTS NEONATAL WHITE MATTER MICROSTRUCTURE AND INFANT NEGATIVE EMOTIONALITY

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Introduction: Poor prenatal sleep health is a pervasive reproductive health concern that informs the health of the mother and fetal development. Despite the almost ubiquitous nature of sleep disturbances across pregnancy, sleep health within pregnant populations, and its effects on the next generation, remain poorly studied. We recently showed that prenatal maternal sleep quality predicts newborn hippocampal volume. However, the relation between prenatal sleep quality and neonatal neural circuit development remains unknown. Changes in neonatal white matter microstructure presage compromised socioemotional and cognitive health, including the development of psychopathology and neurocognitive disorders, making it a plausible neurobiological pathway linking prenatal maternal sleep and offspring socioemotional health. This study

first examined the relations between trajectories of prenatal maternal sleep quality and subsequent neonatal white matter integrity. We next evaluated whether neonatal white matter integrity partially mediates associations between prenatal sleep and infant negative emotionality.

Methods: Pregnant participants (n = 116) provided prospective and longitudinal data of prenatal maternal sleep quality at 16, 29, and 35 gestational weeks using the Pittsburgh Sleep Quality Index. Neonatal (53% female) white matter integrity was assessed via diffusion weighted images using magnetic resonance imaging (MRI). Infant negative emotionality was collected at 6 postpartum months using the Infant Behavior Questionnaire.

Results: Trajectories of prenatal maternal sleep quality predicted higher bilateral neonatal fractional anisotropy (FA) in the uncinate fasciculus (e.g., right: b = 0.15, p = .023). Further, higher uncinate FA predicted more infant negative emotionality (e.g., right: b = 0.25, p = .011) and uncinate FA partially mediated the association between prenatal maternal sleep and infant negative emotionality (right: indirect effect = 0.014, CI = [.0001, .0323], p < .05). Associations remained after covarying for infant postconceptional age at MRI, motion in MRI scan, sex, and income-to-needs ratio.

Conclusion: These findings highlight prenatal maternal sleep health as a prenatal signal with intergenerational connections to offspring neurobiology and negative emotionality, both of which have been previously implicated in the development of psychopathology. Pregnancy is a sensitive period in which interventions may inform the health of two generations.

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0099

CIRCADIAN REST-ACTIVITY RHYTHM DEVELOPMENT IS ASSOCIATED WITH WEIGHT GAIN IN EARLY INFANCY

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Introduction: In early childhood, irregular sleep schedules that may promote circadian rhythm misalignment predict greater weight gain. However, circadian rest-activity (CRA) rhythmicity in infancy in relation to growth is understudied. The aim of the present study was to investigate the association between newborn circadian rest-activity rhythmicity and change in weight-for-age from birth to three months.

Methods: Data were captured as a secondary data analysis from the Snuggle Bug / Acurrucadito Study (see Support). English or Spanish speaking mothers (n=41, age M $\pm$ SD=33.1 $\pm$ 4.6y, 31.7% Hispanic/Latina) and their full-term ($\geq$ 37wk) infants of normal weight (2.5-4kg; 58.5% female; 25.6% WIC enrolled) were recruited from Phoenix, Arizona. CRA rhythmicity was measured at eight weeks with ankle-worn Micro Motionloggers (Ambulatory Monitoring Inc.) for five 24hr periods at one-minute epochs. CRA metrics assessed included 24hr autocorrelation, mesor, magnitude, acrophase, goodness-of-fit R², interdaily stability, intradaily variability, and relative amplitude. Birthweight was mother-reported and 3mon infant weight was measured with a Seca

scale. Weight-for-age Z-scores (WAZ) by infant sex were computed based upon World Health Organization growth charts and the change difference between timepoints was the primary outcome. Regression models adjusting for birth WAZ examined the relationships between CRA metrics at eight weeks with change in WAZ from birth to 3mo.

Results: At eight weeks, mean $\pm$ SD CRA metrics were as follows: 24hr autocorrelation of 0.25 $\pm$ 0.03, mesor of 115.6 $\pm$ 14.7, amplitude of 68.1 $\pm$ 18.3, goodness-of-fit R² of 0.42 $\pm$ 0.10, acrophase of 14:12 $\pm$ 1:42, interdaily stability of 0.57 $\pm$ 0.12, intradaily variability of 0.93 $\pm$ 0.19, and relative amplitude of 0.61 $\pm$ 0.11. Mean birth WAZ and change in WAZ from birth to 3mon were 0.39 $\pm$ 0.73 and -0.57 $\pm$ 0.77, respectively. After adjusting for birth WAZ, in separate models, greater mesor (R² Change=0.10, β =-0.32, p =0.03), amplitude (R² Change=0.11, β =-0.34, p =0.03), and goodness-of-fit R² (R² Change=0.10, β =-0.32, p =0.04) were significantly associated with less change in WAZ from birth to 3mon.

Conclusion: Among relatively healthy, full-term infants born of normal weight, greater 24hr circadian rest-activity rhythmicity achieved by 8 weeks was associated with slower rate of weight gain across the newborn stage. Promoting behaviors and environmental cues from parents that strengthen early circadian rhythmicity in their infants may promote healthy weight trajectories.

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0100

DEVELOPMENTAL TRAJECTORIES OF SWA AND ORP SINCE CHILDHOOD IN YOUNG ADULTS: ASSOCIATION WITH PSYCHIATRIC/BEHAVIORAL DISORDERS

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Introduction: Declines in non-rapid eye movement (NREM) sleep slow wave activity (SWA) in the transition to adolescence are indicative of brain maturational changes that parallel a decline in sleep depth, as measured by the novel sleep EEG biomarker odds ratio product (ORP). However, these developmental trajectories and their psychiatric/behavioral associations have lacked replication across multiple time points during the lifespan.

Methods: We determined the developmental trajectories (median follow-up 15y) of SWA and ORP among 150 participants from the Penn State Child Cohort studied in childhood (median age 9y) through adolescence (median age 16y) into young adulthood (median age 24y). Discrete mixture models for clustering of longitudinal data series was used to compute the probability of a subject belonging to mutually-exclusive 2 or 3 trajectory groups, which were selected based on Bayesian and Akaike Information Criteria. Cochran-Mantel-Haenszel tests were used to compare the proportion of subjects with psychiatric/behavioral disorders across the three developmental trajectories in each sleep EEG biomarker.

Results: Age-related declines in SWA were observed across two developmental groups, of which one followed a cubic trajectory and one a linear trajectory. This decline in SWA was coupled with age-related increases in ORP across three

developmental groups, two of which were quadratic and one was linear. Compared to the shallowest trajectories, the SWA and ORP trajectories with the greatest slopes in the transition to young adulthood had a significantly higher proportion of participants with a history of psychiatric/behavioral disorders (78.6% vs. 53.2% and 80.0% vs. 50.7%, respectively, both p < 0.01).

Conclusion: Our novel data provide replication for the maturational trajectories of SWA and ORP by including time points across three distinct developmental stages, including young adulthood. Also, our data provide evidence linking the developmental trajectories of SWA and ORP with psychopathology. Young adults with psychiatric/behavioral disorders are associated with a steeper developmental decline in sleep intensity (SWA) and sleep depth (ORP) after adolescence.

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0101

GREATER VARIABILITY IN SLEEP HEALTH IS ASSOCIATED WITH OBESOGENIC APPETITIVE TRAITS IN 6-YEAR-OLDS IN THE INSIGHT STUDY

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Introduction: Poor sleep health is associated with increased risk for childhood obesity, but the underlying mechanisms are unclear. Eating behaviors may play a role. We examined the association between appetitive traits and objectively-measured sleep variables in 6-year-old children. We hypothesized that poorer or more variable sleep health measures would be associated with higher levels of food approach traits (food responsiveness, enjoyment of food, emotional overeating, and desire to drink), and lower levels of satiety responsiveness.

Methods: Participants were from an observational long-term follow-up of INSIGHT, an RCT of a responsive parenting intervention for first-time mothers compared to a safety control intervention. At age 6 years, children wore wrist actigraphy (Spectrum Plus) for 7 days to assess sleep. Children with ≥ 3 valid days were included in analyses ($n=167$). Mothers completed the Children's Eating Behavior Questionnaire to assess appetitive traits. Separate regression models examined the association between appetitive traits and sleep variables (M/SD of nighttime total sleep time (TST), onset, offset, and midpoint of sleep timing, and sleep maintenance efficiency), controlling for intervention group, child age, sex, and overweight status.

Results: Mean TST was unrelated to appetitive traits; greater variability (SD) in TST was associated with higher food responsiveness ($B=0.008$, $p=0.03$) and desire to drink ($B=0.010$, $p=0.04$). Mean sleep onset time was unrelated to appetitive traits, but greater variability in sleep onset time was associated with higher desire to drink ($B=0.686$, $p=0.004$). Higher mean sleep maintenance efficiency was associated with higher satiety responsiveness ($B=0.035$, $p=0.04$) and lower enjoyment of food ($B=-0.053$, $p=0.008$). Greater variability in sleep maintenance efficiency was associated with higher enjoyment of food

($B=0.092$, $p=0.03$) and lower satiety responsiveness ($B=-0.089$, $p=0.01$). Emotional overeating was unrelated to sleep variables, and sleep offset and midpoint were unrelated to appetitive traits.

Conclusion: Other than sleep efficiency, mean levels of sleep health appear unrelated to appetitive traits, but greater variability in sleep health measures were associated with higher levels of potentially obesogenic traits and lower levels of protective traits. Future studies should examine whether promotion of sleep regularity can improve regulation of eating behavior and reduce childhood obesity risk.

Support (if any): R01DK088244, KL2TR002015

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0102

ARE THERE ASSOCIATIONS BETWEEN INTRAINDIVIDUAL VARIABILITY IN SLEEP AND MENTAL HEALTH AMONG ADOLESCENTS REPORTING ALCOHOL USE?

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Introduction: Considering the increasing number of studies that report on ecological momentary assessment by uses of sleep diary and actigraphy, it may also be valuable to consider the relationship between fluctuations that exists in sleep measures on adolescent health outcomes. Above the impact of mean sleep measures, intraindividual variability (IIV) in sleep provides information on the degree to which daily variations or fluctuations in sleep/wake patterns are occurring and may prompt important cues to adolescents' health outcome. The present study examined the objective IIV in sleep and its relationship to their sleep and mental health outcomes among adolescents with history of alcohol use.

Methods: The study analyzed 8 days of wrist actigraphy data from 72 high school students reporting prior alcohol use (58.3% female; mean age 17.0 years). Bayesian variability method using *varian* (R package) was performed to calculate IIV in total sleep time (TST), time in bed (TIB), midpoint sleep, bedtime, and risetime. Participants also completed Pittsburgh Sleep Quality Index (PSQI), Cleveland Adolescent Sleepiness Questionnaire (CASQ), Inventory of Depressive Symptomatology (IDS-SR-30), Chapman's Inventories – Social Anhedonia (CHAPSAS), and Rutgers Alcohol Problem Index (RAPI). Multiple linear regression models were adjusted for biological sex, age, and the sum of alcohol drinks in the past 3 months.

Results: Participants reported average of 18.52 (SD=23.10) total drinks consumed over the past 3 months. IIV in TST, TIB, and risetime were associated with lower sleep quality ($B=3.04$, 95% CI, 0.02, 7.39, $p<0.05$ for IIV in TST; $B=2.87$, 95% CI, 0.39, 5.88, $p<0.05$ for IIV in TIB; and $B=2.74$, 95% CI, 0.57, 6.19, $p<0.05$ for IIV in risetime, respectively). There was no statistically significant association between IIV of sleep measures and excessive daytime sleepiness or mental health outcomes such as social anhedonia, depressive symptoms, and problematic alcohol use.

Conclusion: Greater fluctuation in TST, TIB, and risetime were negatively associated with overall sleep quality. Our findings add to a growing body of research on IIV in sleep/wake patterns and clinical implications. Future studies should explore the prospective

relationship between variability in sleep and other various health outcomes.

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0103

GREATER ACTIGRAPHIC SLEEP VARIABILITY AND LATER TIMING ARE ASSOCIATED WITH MORE SCHOOL-RELATED PROBLEMS IN ADOLESCENTS

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Introduction: Adolescents often obtain short sleep duration, which has been linked to poor grades and greater behavioral issues at school. There is limited research on the association between other dimensions of sleep and school-related outcomes, and few studies use objective measures of sleep. The current study examined associations of multiple actigraphic sleep dimensions with school-related outcomes among adolescents.

Methods: Data were collected from a sub-study of the age 15 wave of the Fragile Families and Child Wellbeing Study ($N=774-782$ depending on the outcome), a national sample of diverse teens. Adolescents wore a wrist-actigraphy device for approximately one week (mean=6.6 nights) and completed a survey reporting current grades and current or past problems at school. Separate linear and logistic regression models assessed whether actigraphic sleep duration, timing, maintenance efficiency, variability (SD) in duration and timing, and sleep regularity index (SRI) were associated with grades and behavioral issues at school. Analyses adjusted for demographic and household characteristics, depressive symptoms, and anxious symptoms.

Results: Greater variability in sleep onset was associated with higher odds of receiving a D or F in any course ($OR=1.29$, $p=.040$) and of ever failing a course ($OR=1.26$, $p=.038$). Later sleep onset ($\beta=-.07$, $p=.029$) and offset ($\beta=-.08$, $p=.014$) and greater variability in sleep duration ($\beta=-.07$, $p=.035$) were associated with fewer A grades. Later sleep offset was also associated with lower average GPA ($\beta=-.07$, $p=.033$). Later sleep onset ($OR=.91$, $p=.049$) and offset ($OR=.91$, $p=.035$) and greater variability in sleep offset ($OR=.83$, $p=.029$) were associated with lower odds of ever taking an honors course. Later sleep offset ($OR=1.11$, $p=.034$) and greater variability in sleep duration ($OR=1.31$, $p=.012$) and onset ($OR=1.42$, $p=.004$) were associated with higher odds of ever being suspended or expelled in the past two years. Greater variability in sleep duration was associated with greater behavioral problems in school ($\beta=.13$, $p<.001$). Sleep duration, maintenance efficiency, and SRI were not associated with school-related outcomes ($p\geq.05$).

Conclusion: Later sleep timing and greater sleep variability are risk factors for school-related problems among adolescents. Promoting earlier sleep timing and reducing sleep variability across the week may improve academic and behavioral outcomes among adolescents in school.

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0104**GREATER SLEEP REGULARITY AMONG ADOLESCENTS PREDICTS LESS DAYTIME VIDEO GAME PLAYING**

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Introduction: Daytime video game playing is a sedentary behavior that has been associated with worse adolescent health outcomes, including obesity, mood disorders, and poor sleep. However, few studies have explored the influence of sleep on time spent engaged in screen-based activities. This is the first study to examine whether sleep regularity, a measure that encapsulates within-person sleep timing, duration, and disruption across successive days of actigraphy, is associated with daytime video gaming among adolescents.

Methods: We analyzed sleep sub-study data from the age 15 wave of the Fragile Families and Child Wellbeing Study (n=314 adolescents, 15.4±0.5 years old). Adolescents wore wrist actigraphy devices and concurrently completed daily surveys reporting how many hours they played video games. The sleep regularity index (SRI) was calculated as the percentage probability of an individual being in the same sleep/wake state at any two times 24 hours apart across seven consecutive days of valid actigraphy (range 0-100). Multilevel Poisson models with random intercepts for daily video gaming adjusted for school days, sex, ethnoracial group, bedtime routines, parent education, family poverty, and family structure. The stability of the association between SRI and video gaming was additionally tested using the first two to six consecutive days of actigraphy.

Results: Every 10 units increase in SRI was associated with 9% fewer daily hours of video gaming on average (OR=0.91, CI=0.84, 0.998, p=0.046). Findings were consistent when SRI was calculated using the first four or more consecutive days of actigraphy (8-10%, p≤0.043), and the association was nonsignificant when using the first two or three days.

Conclusion: Adolescents who had greater sleep regularity tended to spend less time playing video games. Future research should consider interventions that target the consistency of sleep patterns across the week. Improving the regularity of sleep timing and duration may reduce video game playing and confer positive downstream effects on adolescent health.

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0105**INSIGHT STUDY ASSOCIATIONS BETWEEN SLEEP HEALTH AND CHILD BEHAVIOR AT AGE 6 YEARS**

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Introduction: Sub-optimal sleep duration, quality and timing are associated with the presence of disruptive behaviors in

childhood. Previous studies have largely utilized parent-/teacher-report of children's behaviors and focused on mean sleep duration and quality measures, ignoring sleep variability. This analysis uses actigraphy and standardized laboratory behavioral tasks to examine the associations of average levels and variability (SD) of sleep duration, timing, and quality with child behavior.

Methods: The Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) Study randomized families with firstborn newborns to a responsive parenting intervention or a safety control shortly after delivery. At age 6 years, children wore a wrist actigraphy device (Spectrum Plus) for 7 days to measure sleep and completed frustration (Transparent Box) and parent-child interaction (Picture Frame) tasks. Tasks were recorded and coded using global behavioral coding schemes; inter-rater reliability was sufficient (Transparent Box ICCs=.83-.97; Picture Frame=.83-1). Children with data on sleep (≥3 valid days) and both behavioral tasks were included in this secondary data analysis (n=143). Separate linear regression models examined associations between 10 sleep variables (M/SD of onset, offset, and midpoint of sleep timing, sleep maintenance efficiency, and total sleep time) and 4 behavioral variables (Transparent Box: emotion regulation, impulsivity; Picture Frame: prosocial and antisocial behavior). Models controlled for child sex and age, household income, and study group.

Results: Children were aged 6.7 ± 0.3 years and predominantly White, non-Hispanic (95%). Sleep onset (timing) variability was positively associated with impulsivity (B=.85, p=.004) and negatively associated with emotion regulation (B=-.65, p=.01). Sleep midpoint (timing) variability was positively associated with impulsivity (B=.80, p=.03). Mean sleep timing, sleep duration, and sleep maintenance efficiency were not associated with any of the behavioral variables.

Conclusion: The regularity of sleep timing (onset and midpoint) at age 6 had a greater role in behavioral and emotional regulation than duration and quality of sleep. These findings support existing literature that highlight the importance of parents implementing consistent routines (e.g., consistent bedtime) and how such routines play a key role in socioemotional outcomes among children.

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0106**PROSPECTIVE SLEEP PATTERNS IN INFANTS LATER DIAGNOSED WITH ASD: A CASE SERIES**

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Introduction: Sleep problems among individuals with autism spectrum disorder (ASD) are pervasive across the lifespan. However, little is known about the emergence of sleep patterns in the months preceding a child's diagnosis. It is unclear whether sleep problems precede diagnoses and the emergence of core diagnostic features, or whether they simply co-emerge with early behavioral markers across the first three years of life. Thus, our study examined prospective patterns of sleep and development from 6-36 months among children at high familial likelihood for ASD, beginning prior to features of ASD/atypical development.

Methods: Using a case series approach, participants included 9 children at high familial likelihood for ASD—3 who developed ASD, 3 who had early ASD concerns but did not develop ASD (ASD-C), and 3 who were typically developing (TD). Sleep

was assessed using actigraphy. Developmental competence and ASD features were monitored using standardized assessments (ASOS-2 and MSEL) and parent reports (VABS, M-CHAT).

Results: All children with ASD experienced sleep difficulties in early development (e.g., extended night wakings). However, different patterns emerged for each child: adequate sleep at six months, followed by less severe but persistent sleep problems across development (case 1); low levels of sleep problems during early infancy, followed by improved sleep from 9-15 months and a sharp increase in sleep problems at 24 months (case 2); sleep problems at 9 and 12 months, followed by a decrease in sleep problems across the remainder of early development (case 3). In general, sleep problems emerged prior to ASD diagnoses and did not appear to covary with ASD symptoms. However, sleep problems for case 2 intensified in line with a significant regression in skills and the onset of ASD features at 24 months.

Conclusion: Sleep problems are a normative part of infancy for most children—including those with TD. However, sleep may begin to distinguish some children with ASD from their peers around 12 months of age. Although sleep problems appear most severe and persistent for children with ASD, patterns are variable and sleep intervention efforts should be individualized to meet the heterogeneity in ASD.

Support (if any): R00 MH092431; PI Schwichtenberg.

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0107

REST-ACTIVITY RHYTHMICITY ACROSS THE LIFESPAN: FINDINGS FROM THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES)

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Introduction: Non-parametric metrics of interdaily stability (IS), relative amplitude (RA), and intradaily variability (IV) characterize between- and within-day rest-activity rhythms. Prior research has reported differences in these metrics by age and race/ethnicity, but these differences have not been widely assessed in children and adolescents. Therefore, we investigated associations of these metrics with sociodemographic factors across the lifespan, including children, in a US-representative cross-sectional study.

Methods: Rest-activity metrics were derived from actigraphy data (wrist-worn GT3X+ ActiGraph devices) measured over one week in the 2011-2014 National Health and Nutrition Examination Survey (NHANES). Pregnant participants and participants with < 4 days of valid data were excluded; missing activity data were imputed and pooled using Rubin's rule. Population-weighted linear and ordinal logistic regression (quartiles) models were fit to examine the associations of age, gender, smoking, body mass index (BMI), income-to-poverty ratio, and self-reported race/ethnicity with rhythmicity measures. Stratified analyses by age groups were conducted.

Results: There were n=12,526 participants aged 3-80 years. In adjusted analyses, IS and RA (higher: stronger rhythms) decreased with age and were lower among men, whereas IV (higher: weaker rhythm, greater fragmentation) increased with age ($p < 0.05$). Higher income-to-poverty ratio associated

with higher RA (1-unit OR=1.11, 95%CI:1.06,1.16) and IV (1-unit OR=1.10, 95%CI:1.07,1.13). Greater BMI associated with lower RA and IS and higher IV ($p < 0.05$). Smoking associated with decreased values for all metrics. Compared to the non-Hispanic White group, the Asian, non-Hispanic Black, and Other/Multiracial groups were more likely to have lower RA, lower IS, and higher IV ($p < 0.05$). Compared to the non-Hispanic White group, the Mexican American (OR=0.83, 95%CI:0.72,0.95) and Other Hispanic (OR=0.83, 95%CI:0.73,0.94) groups were less likely to have higher IV. Analyses stratified by age (≤ 18 , > 18 years) resulted in similar patterns among the Asian, non-Hispanic Black, and Other/Multiracial groups ($p < 0.05$).

Conclusion: Rest-activity rhythms differ by age, gender, BMI, income, smoking, and race/ethnicity, representing possible windows for public health intervention and sleep health promotion. Differences in rest-activity measures by race/ethnicity begin in childhood, are evident in early adolescence, and persist throughout adulthood. Future analyses will evaluate the contribution of environmental factors to these differences.

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0108

SLEEP HEALTH OF ADOLESCENTS IN THE DEPARTMENT OF JUVENILE JUSTICE: A QUALITATIVE ANALYSIS OF NIGHT STAFF INTERVIEWS

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Introduction: Limited research exists regarding the sleep environment and sleep health of youth in juvenile justice facilities. We examined the perspectives of facility night staff on the sleep-living environment and conditions of detained youth using semi-structured interviews.

Methods: In collaboration with Maryland's Department of Juvenile Services (DJS) we conducted virtual semi-structured interviews (45 minutes) with superintendents, medical staff, and night staff at all state facilities. We present the data reported by night staff (n=10) here, each representing a different facility. Interview questions focused on facility structure, protocols, and youth healthcare. Inductive qualitative analyses examined high frequency themes with the aim of understanding the sleep environment, sleep patterns, and overall youth wellbeing. After transcription of each interview, coder 1 examined each transcript to identify high frequency themes; coder 2 reviewed these first codes. Few disagreements occurred; in those cases, a third coder helped reach consensus. Theme frequency is expressed as a percentage of the total number of transcriptions (e.g., 4 interviews out of 10=40%).

Results: Major themes reported by night staff include environmental disruptions, ability to personalize sleep areas, youth well-being, and sleep challenges. Environmental disruptions included moderate noise levels (40%); youth temperature complaints (50%); and youth lighting complaints (60%). More specifically, 50% reported youth reported night lighting complaints (including blue light) within the dorms. While 40% described room personalization is allowed, 40% stated it is also limited. For instance, while youth are allowed to display family pictures, they are not allowed to display any gang-related material as it could cause altercations between youth. Complaints of trouble sleeping is addressed in 50%

of facilities by utilizing a weeklong sleeping log (e.g., staff report number of times youth are awake during the night during their safety checks). Seventy percent of staff reported that work affects their sleep and psychological wellbeing and 60% shared that they sleep 3 - 6 hours/night.

Conclusion: Assessment and modifications of the sleep-living environment in juvenile justice facilities are needed. Ongoing countermeasures in the Maryland system include noise buffering panels, light modifications, and sleep-health staff trainings.

Support (if any): Kolvenbach grant, Loyola University Maryland and Maryland Department of Juvenile Services' supportive collaboration.

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0109

THE IMPACT OF PUBERTAL DEVELOPMENT ON CHILDREN'S CHRONOTYPE, SLEEP AND CHANGES IN MENTAL HEALTH

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Introduction: Approximately 70% of adolescents do not obtain the required amount or quality of sleep expected for healthy functioning (Wheaton et al., 2018). Deficient sleep is so pervasive for adolescents that it could be considered an epidemic due to its adverse impact on mental and physical health (Shochat et al., 2014). Pubertal development tends to result in children's delayed sleep phase, which has been linked to deficient sleep and greater psychosocial problems (Crowley et al., 2018; Owens et al., 2014). However, there is a paucity of research that has longitudinally examined these inter-related constructs. Accordingly, this study examined the longitudinal role of children's pubertal development on their subsequent chronotype, sleep, and well-being.

Methods: Data were collected through the Adolescent Brain & Cognitive Development study (2021, release 4.0) and included waves 2 (48.7% female; Mchild_age=10.95 years, SD=.67) and 3 (Mchild_age=12.02, SD=.67). A total of 5949 children had their sleep duration and variability recorded at wave 3 with Fitbit watches, which were worn across an average of 13.8 nights (SD=9.9). At waves 2 and 3, parents reported on their child's mental health with the Child Behavioral Checklist (Achenbach & Rescorla, 2001). Children self-reported on their pubertal development (Peterson et al., 1988) at wave 2 and their chronotype at wave 3 (Roenneberg et al., 2003). Most participants identified as white (52.4%), with another 24.0% identifying as Hispanic/Latinx, 13.4% identifying as Black, 5.9% American Indian/Alaska Native/Native Hawaiian/Pacific Islander, and 4.2% as multi-race. The families were economically diverse with 21.5% reporting family incomes of <\$25,000 and 6.8% with incomes of >\$200,000.

Results: Mediation analyses, conducted using Mplus (v.8.8, Muthén & Muthén, 2022), examined if pubertal development at wave 2 predicted residual change in children's mental health via the mediating variables of chronotype and both sleep duration and variability. Children's age, sex, body mass index, and socio-economic status were included as covariates. Model fit was excellent. Results suggested greater pubertal development indirectly predicted increases in children's mental health problems via chronotype (i.e., greater eveningness) and longer sleep duration and greater sleep variability.

Conclusion: Given typical changes to children's sleep during puberty, findings highlight the critical connections to their mental health.

Support (if any):

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0110

THE INFLUENCE OF CHANGING SCHOOL START TIMES ON FREQUENCY AND TIMING OF NURSE'S VISITS FOR SLEEP AND NUTRITION

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Introduction: Healthy school start times are important for ensuring students obtain sufficient sleep, which may impact other health outcomes. Previous studies have not examined the impact of changing school start times on nurses' visits related to sleep and nutrition in students in grades K-12 after district-wide changes to delay start times in middle and high school and advance start times in elementary school.

Methods: Electronic medical record data (reason for student visit and time of visit) were retrieved from nursing offices for elementary (n=44), middle (n=14), and high (n=6) schools. For this study, we included sleep and nutrition visits within the first two hours of the school day in April/May for the year prior (pre-change) and two years after (post-change, follow-up) implementing new school start times. Within each school level (i.e., elementary, middle, high), descriptive statistics examined the number of visits by health category.

Results: In elementary school, nurse visits increased in the first two hours when school start times were moved from 9:00am to 8:00 am for both sleep (pre-change n=45; post-change n=78; follow-up n=58) and nutrition (pre-change n=30; post-change n=63; follow-up n=48). For middle school, nurse visits slightly decreased in the first two hours of school when start times were moved from 8:00am to 8:50am for both sleep (pre-change n=14; post-change n=11; follow-up n=11) and nutrition (pre-change n=47; post-change n=42; follow-up n=6). High school nurse visits also slightly decreased in the first two hours of school when start times moved from 7:10am to 8:20am for both sleep (pre-change n=16; post-change n=7; follow-up n=7) and nutrition (pre-change n=5; post-change n=5; follow-up n=2).

Conclusion: While not unexpected, elementary school nurse visits for sleep and nutrition increased when start times were moved earlier. However, at follow-up, visit frequency notably decreased, suggesting that it may take time for families to adjust to the new start times. For both middle and high school students, nurse visits for sleep and nutrition slightly decreased with later start times. More research is needed to determine optimal start times for elementary school students, as healthy start times are essential for adolescent health and well-being.

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0111

WEARABLE-BASED MEASURES OF SLEEP ACROSS THE MENSTRUAL CYCLE IN HEALTHY WOMEN IN THE REPRODUCTIVE STAGE AND EARLY MENOPAUSE

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Introduction: Sleep is an essential part of women's health and well-being. Hormonal fluctuations that occur across the menstrual cycle or when approaching menopause might affect sleep quality. Most studies rely on self-reported data, or laboratory measures in small samples, to examine changes in sleep across the menstrual cycle. Here, we investigated sleep quality, as measured continuously with a wearable device, across the menstrual cycle in different reproductive stages (reproductive, menopausal transition).

Methods: 56 women participated, with 31 in the reproductive stage (age: 24.65 $\pm$ 6.09 years) and 25 in the early menopausal transition (47.36 $\pm$ 2.78 years). Participants were healthy, without sleep disorders, and free of premenstrual and mood complaints, as well as not using hormonal contraceptives. Sleep was tracked with the Oura ring across an entire menstrual cycle – confirmed as ovulatory using ovulation tests. Participants also completed a sleep diary each morning, rating sleep quality and how refreshed they felt. Measures were averaged for four phases: menses, ovulation, mid-luteal, late-luteal. Participants were assessed for mood symptoms (DASS-21) once during each of these phases.

Results: Objective measures of sleep quality (Total Sleep Time, Efficiency, and Wake After Sleep Onset) did not change across the menstrual cycle in either group or differ between groups. Similarly, self-reported sleep and mood symptoms remained stable across the menstrual cycle, although women in the menopausal transition reported poorer sleep quality and felt less refreshed than reproductive stage women, overall. Physiological measures (Temperature, Heart Rate, and Heart Rate Variability) during sleep reflected the well-known fluctuations across the menstrual cycle (e.g., increased temperature in the luteal phase vs. menses) in both groups of women.

Conclusion: Objective, wearable-derived measures indicate sleep quality remains stable across the menstrual cycle during reproductive and early-menopausal transition stages, at least in healthy women without mood or premenstrual complaints. While women in the menopausal transition reported a poorer sleep quality, there was no difference in objective sleep continuity measures between groups. Future studies are needed to better understand sleep across the reproductive lifespan, considering cycle-related (e.g., premenstrual syndrome) and other factors that could make some women sensitive to menstrual cycle effects on sleep.

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0112

ACUTE SLEEP RESTRICTION AND CIRCADIAN MISALIGNMENT IMPAIRS ATTENTION IN HIGH SCHOOL STUDENTS

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Introduction: We examined the impact of acute sleep restriction and circadian misalignment on reaction times in adolescents.

Methods: Adolescents (n=38, 21 girls) aged 14.1-18.0 years completed a 14-day protocol. On days 1-7, participants slept at home on individualized 10-h sleep/dark schedules. On days 8-14, they lived in the laboratory. On day 8, Dim Light Melatonin Onset (DLMO) was measured. On Days 9-13, sleep opportunity was restricted to 8.5h (n=9), 7h (n=12), or 5.5h (n=8). A fourth group was not sleep restricted and had a 10-h sleep opportunity (control; n=9). On days 11-13, sleep/dark gradually shifted earlier with morning bright light to advance circadian rhythms. Final DLMO was measured on day 14. Participants completed simple reaction time tasks on days 5 (baseline), 11 (after 2 sleep restriction (SR) nights = post-SR), and 13 (after 2 shifted sleep/dark nights = post-shift). Testing began 2.5h, 5.5h, 8.5h, and 11.5h after wake. Daily difference from baseline scores for post-SR lapses, median reaction time (MedRT), mean 1/RT (responses/sec), fastest 10% RT (F10), and slowest 10% 1/RT (S10) were compared between sleep opportunity groups. Final temperature minimum (Tmin) was estimated post-hoc (Final DLMO+7h). Tmin 2-4h before wake defined an aligned subgroup (N=16) and Tmin after wake defined a misaligned subgroup (N=10). Post-SR scores (day 11) were subtracted from post-shift scores (day 13) at corresponding times relative to wake. Aligned and misaligned subgroups were compared to determine the of impact circadian misalignment.

Results: Lapses [F(3,34)=3.8,p=.02] and MedRT [F(3,34)=3.3,p=.03] increased from baseline in a SR-dose-dependent manner. Lapses and MedRT increased more with 7hSR (lapses Δ =19.4 $\pm$ 9.1; MedRT Δ =80.7 $\pm$ 51.4 msec) and 5.5hSR (lapses Δ =25.8 $\pm$ 18.6; MedRT Δ =99.5 $\pm$ 74.6 msec) compared to Control (lapses Δ =5.4 $\pm$ 4.8; MedRT Δ =20.8 $\pm$ 21.7 msec). Mean 1/RT, F10, and S10 showed similar trends (p's $\leq$ 0.1). MedRT slowed [t(24)=2.24,p=0.04] and response rate decreased (Mean 1/RT: t(24)=2.06,p=.05; S10: t(24)=2.16,p=.04) in the misaligned compared to the aligned group 2.5h after wake.

Conclusion: Attention decrements occurred when sleep was restricted to 5.5h or 7h, the latter being a typical sleep opportunity for high school students. Circadian misalignment also contributed to decrements in morning attention, which has major implications for safety during the school commute and academics.

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0113

DATA-DRIVEN MATHEMATICAL MODELING OF SLEEP CONSOLIDATION IN EARLY CHILDHOOD

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Introduction: During early childhood, sleep behavior transitions from a biphasic pattern (daytime nap and nighttime sleep) to a monophasic pattern (nighttime sleep only). The transition to consolidated sleep, occurring in most children between 2- and 5-years old, is a major developmental milestone and reflects interactions between the homeostatic sleep drive and the circadian drive. This study aimed to utilize experimental data and mathematical modeling to determine the contributions of

developmentally-mediated changes in the homeostatic sleep drive to the consolidation of sleep observed in early childhood. **Methods:** Using extant, de-identified longitudinal data from 2.5 – 5.9 year-old children (n=36) and a physiologically-based mathematical model of sleep-wake regulation, we simulate sleep-wake behavior consistent with average 2-year-old napping and 5-year-old non-napping sleep patterns. We vary four homeostatic dynamic parameters between experimentally estimated 2- and 5-year-old values, constraining their variation to follow the trends of the 2-, 3-, and 5-year-old data estimates. We quantify the progression to consolidated sleep including how and at what ages the sleep pattern changes (i.e., bifurcation analysis). Using the range of experimental estimates of the dynamic parameters and varying sensitivity to homeostatic pressure, we investigate interindividual variability in the transition from habitually napping to non-napping. Finally, we analyze how light exposure patterns may impact a child's transition from habitually napping to non-napping.

Results: We find that the data-driven variation of homeostatic parameters results in a transition from biphasic to monophasic sleep. Through variation of the homeostatic parameters' developmental trajectories, we establish that the developmental trajectories influence the timing and duration of the transition from biphasic to monophasic sleep, as well as the predicted sleep patterns occurring during the transition.

Conclusion: We found that the slower homeostatic dynamics estimated in older children contributed to decreased sleep need, lower napping propensity, and shorter sleep durations. We also found that the lower sensitivity to the homeostatic drive was associated with decreased sleep need, shorter sleep durations, and transitions to consolidated sleep at earlier ages. In certain cases, a nap opportunity with dim light exposure promoted an earlier transition to monophasic sleep.

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0114

INTERPLAY OF SCHOOL AND FREE DAYS ON THE ASSOCIATION OF CIRCADIAN MISALIGNMENT WITH HEART RATE VARIABILITY IN ADOLESCENTS

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Introduction: The circadian timing system, which governs the sleep-wake cycle, is involved in cardiometabolic and autonomic regulation. Heart rate variability (HRV), a marker of cardiac autonomic modulation (CAM), is known to predict cardiovascular morbidity. Therefore, circadian misalignment of the sleep-wake cycle, which is highly prevalent in adolescents and may express differently if youth are in school or free-days, is likely to impact CAM. We examined whether deviations in the circadian timing of sleep are associated with blunted HRV in adolescents as a function of being entrained to school or not.

Methods: We studied 337 population-based randomly-selected adolescents from the Penn State Child Cohort (median 16 years; 47% female; 21% racial/ethnic minority) who had at least 3-night at-home actigraphy (ACT), in-lab 9-h polysomnography

(PSG) and 24-h Holter-monitoring heart rate variability (HRV) data. ACT-measured sleep midpoint (SM) was calculated as the midpoint of the sleep period for weekdays (5-nights) and weekends (2-nights), whereas ACT-measured sleep regularity (SR) was calculated as the intra-individual standard deviation of the SM across 5- and 7-nights. Frequency and time-domain HRV indices were primary outcomes. Linear regression models were stratified by "in school" and "on break" to test SM and SR as predictors of HRV indices while accounting for sex, race/ethnicity, age, BMI percentile, ACT-sleep duration, ACT-sleep variability, and PSG-apnea/hypopnea index.

Results: Lower SR on schooldays was associated with lower nighttime Log-HF, Log-LF and SDNN, yet higher HR (all $p < 0.01$); e.g., each standard deviation increase in SR on schooldays (i.e., 45m higher) was associated with -7.15ms (2.57) in nighttime SDNN ($p=0.006$). A later SM on free weekends was associated with lower nighttime Log-HF, Log-LF, SDNN and RMSSD, yet higher HR and LF-HF ratio (all $p < 0.03$); e.g., each standard deviation increase in SM on free weekends (i.e., 1.5h later) was associated with -7.33ms (2.85) in nighttime RMSSD ($p=0.011$).

Conclusion: A delayed and an irregular sleep midpoint during breaks and during schooldays, respectively, were associated with impaired CAM in adolescents. These data suggest that not only circadian misalignment contributes to adverse cardiovascular outcomes but its distinct metrics require measurement under different entrainment conditions in adolescents.

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0115

PSYCHOMETRIC EVALUATION OF THE CHINESE VERSION OF SLEEP HEALTH INDEX IN PREGNANT WOMEN

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Introduction: The aim of this study was to investigate the psychometric properties of the Chinese version of the Sleep Health Index (SHI-C) among pregnant women.

Methods: This study used a cross-sectional design. Pregnant women (N=264) from three public hospitals in China were recruited through a convenience sampling method. The Sleep Health Index (SHI-C) was used to measure sleep health. The Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI) were used to measure sleep quality and insomnia, respectively. Epworth Sleepiness Scale (ESS), Fatigue Assessment Scale (FAS), and Edinburgh Postnatal Depression Scale (EPDS) were used to measure daytime sleepiness, fatigue, and depression, respectively. Structural validity was assessed via confirmatory factor analysis (CFA). Concurrent and convergent validity were assessed using bivariate correlation analyses. Known-group validity was assessed by comparing the SHI-C score between different groups. Cronbach's α was calculated for reliability.

Results: The sample was 30.6 years on average. CFA confirmed the three-factor structure of SHI-C. The SHI-C total and sleep quality sub-index scores had moderate to strong correlations with both PSQI ($r=-0.542$, $p < 0.01$; $r=-0.648$, $p < 0.01$) and ISI ($r=-0.692$, $p < 0.01$; $r=-0.752$, $p < 0.01$). The SHI-C total and sleep quality

sub-index scores were significantly associated with ESS, FAS, and EPDS ($r = -0.171$ to -0.276 ; $p < 0.01$). The SHI-C total score also differed based on work status ($p < 0.01$), trimester ($p < 0.01$), coffee intake ($p < 0.05$), taking a nap ($p < 0.05$), subclinical insomnia ($p < 0.01$), and poor sleep quality ($p < 0.01$). The Cronbach's α of the SHI-C total and the sleep quality sub-index were 0.723 and 0.806, respectively. The Cronbach's α of sleep duration and disordered sleep sub-indices were 0.594 and 0.545, respectively.

Conclusion: Overall, the SHI-C has good validity and acceptable reliability among the pregnant population in China. It can be a useful tool for the assessment of sleep health. More research is warranted to refine the sleep duration and disordered sleep sub-indices.

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0116

A THEORY-DRIVEN, META-ANALYTICAL APPROACH TO EVALUATING OPTIMAL PARENTING BEHAVIORS AND ADOLESCENT SLEEP

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Introduction: For adolescents, affiliative parenting behaviors (e.g., warm) are generally associated with better sleep and non-affiliative parenting behaviors (e.g., hostile) are associated with deficient sleep. However, specificity of interpersonal behaviors is unknown. We applied an interpersonal theoretical framework and conducted a meta-analysis to test and operationalize the theory that safety and security are necessary for good sleep.

Methods: Included in the meta-analysis were 41 studies on adolescent (10-19 years) sleep health and parenting behaviors. Studies included a total of 57,549, primarily female (52%), participants ($M_{age} = 14.92$, $SD_{age} = 2.00$). Race/ethnicity was 76.7% White, 5.9% Black, 6.5% Hispanic, 1.5% Asian, and 9.4% Other. Structural analysis of social behavior (SASB) was applied to define and operationalize optimal (e.g., affiliative and autonomy granting/taking) and sub-optimal (e.g., non-affiliative and autonomy granting/taking) parenting behaviors (independent variable). Dependent variables were sleep regularity, duration, efficiency, latency, timing, quality, alertness/sleepiness, and disturbance. The final effect size of interest for analysis was a correlation efficient r .

Results: Optimal parenting behaviors were associated with longer sleep duration ($r = 0.11$, $p = .02$), decreased latency ($r = -0.16$, $p < .001$), less daytime sleepiness ($r = -0.28$, $p < .001$), and less sleep disturbances ($r = -0.22$, $p < .001$). Suboptimal parenting behaviors were associated with decreased sleep duration ($r = -0.04$, $p = .05$), increased latency ($r = 0.12$, $p < .01$), and more sleep disturbances ($r = 0.38$, $p < .001$).

Conclusion: This study applied interpersonal theory to define and operationalize parenting behaviors and their association with adolescent sleep. Findings support anthropological theory that parental

interpersonal warmth is important for adolescent sleep and further indicate that security likely includes appropriate use of structure and autonomy granting behaviors. SASB analysis additionally revealed significant methodological issues that hamper understanding of the role of parental control (versus autonomy-granting) as separate from parental affiliation (versus hostility). This topic points the way to a crucial next step in developing an empirically grounded and comprehensive interpersonal model of sleep.

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0117

ASSOCIATION BETWEEN MOTHER-CHILD SLEEP-WAKE RHYTHM SYNCHRONY AND MATERNAL EMOTIONAL HEALTH

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Introduction: Synchrony between mother and infant sleep-wake rhythms is positively associated with attachment and maternal mental health. Chronotype is a measure of one's circadian rhythm which influences sleep timing and other physiological processes. Whether synchrony of mother-child chronotype is similarly associated with maternal mental health into early childhood, when children's behavior is less dependent on the mother, is unknown. Thus, we examined the relation between mother-child chronotype synchrony and mother's emotional health.

Methods: 106 healthy preschool-aged children (50.78 ± 9.54 months) and mothers (34 ± 8.7 years) were included in this secondary analysis. Wrist-worn actigraphy (range 3-16 days) was used to assess sleep duration and sleep midpoint. The Munich Chronotype Questionnaire was used to calculate midpoint of overnight sleep on free days (MSFsc) which was corrected for sleep debt on workdays. Dyad synchrony was calculated as a phase angle (phase difference) between mothers' MSFsc and children's MSFsc. Maternal emotional health was measured with the Center for Epidemiologic Studies Depression Scale (CESD).

Results: Linear regression (adjusted for the child's age, sex, Peabody Picture Vocabulary Test score, and maternal socioeconomic status, employment status, and shiftwork) indicated no significant association between dyad synchrony and mothers' emotional health ($p = 0.33$). However, a median split on mothers' emotional health scores (CESD) supports that children's MSFsc is later (i.e. later chronotype) in mothers with more depression symptoms ($p < .01$).

Conclusion: The present results provide tentative support for the hypothesis that earlier child chronotype is associated with better maternal mental health even into early childhood. Future research needs to be done to elucidate whether mothers whose sleep is not aligned with their child's primary sleep bout may experience less attachment and more negative interactions with their child leading to worse mental health. Further analyses will consider additional measures of synchrony that incorporate more than just the alignment of sleep midpoint. These findings may point to a possible source of poor maternal mental health which can be targeted in future research.

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0118

ASSOCIATION BETWEEN TNF- α G308A POLYMORPHISM (RS1800629) AND INSOMNIA VULNERABILITY IN FERTILE AGE WOMEN WITH PRIMARY DYSMENORRHEA

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Introduction: Higher tumor necrosis factor- α (TNF- α) gene expression has been revealed in the peripheral blood monocytes across the menstrual cycle in patients with primary dysmenorrhea (PDM) than in the unaffected control. Sleep quality is affected by environmental factors, endocrine function abnormalities and genetic factors. The aim of this study was to evaluate the effect of TNF- α G308A polymorphism (rs1800629) on the self-reported sleep, health, menstrual pain severity as well as peri-ovulatory serum TNF- α level in women with and without PDM.

Methods: Sleep, psychological and physiological characteristics and menstrual pain severity were collected with questionnaires and sleep/menstrual diary within a menstrual cycle from a cohort of 43 PDM women and 42 healthy controls (aged 20-30 years, right-handed, non-smoking and non-shift workers without psychiatric, sleep and neurological comorbidity). Chi-square tests were used to check if the genotype proportions of the investigated gene fitted the Hardy-Weinberg equilibrium (HWE) and to evaluate if the genotypic and allelic distribution is associated with PDM. Chi-square tests or analysis of variance were used to examine the effects of genotype, group and/or genotype x group interaction with the sleep, mind and the body health variables.

Results: Neither allele frequencies nor genotypes of TNF- α G-308A gene could serve as an independent risk factor of PDM in the Taiwanese population. Circulating serum TNF- α did not correspond with the -308 TNF- α promoter polymorphism, either, which might be due to a multifactorial control process. The TNF- α 308 A allele carriers (28.6%) which was less common than the G allele carriers (71.4%), showed lower Beck depression score, lower bodily pain and better physical health and higher subjective sleep quality. Furthermore, in G allele carriers, the PDM group showed higher insomnia severity and lower sleep duration than that of the control group.

Conclusion: Present results suggested that TNF- α polymorphism conferred no prediction to PDM risk and peri-ovulatory serum TNF- α level. However, our findings were evident that the A allele at the TNF α 308 locus, as compared to the more common G allele, was associated to better health and better sleep, with an indication of a genetic underpinning to their better resistance from the risk of PDM.

Support (if any):

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0119

CHARACTERIZING SLEEP PATTERNS AMONG SCHOOL-AGE CHILDREN IN ACCRA, GHANA

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Introduction: Sleep habits among school-age children in North American and European countries is well-documented and most health recommendations are based on those data. What is woefully lacking in the literature is objective sleep data from the Global South, particularly from sub-Saharan African countries. Lack of data in this population represents a major gap in our knowledge and a barrier to the establishment of guidelines for healthy sleep for all children. Here, we begin to broaden the view of child sleep by characterizing sleep and chronotypes of school-age children in Accra, Ghana.

Methods: Children (N=34; Mage=10.03, range:9-13 years; 51.5% female) wore actigraph watches for two weeks (M=11 nights). Additionally, children and their caregivers completed surveys pertaining to demographics, sleep habits, and household environment. Chronotype was assessed using the Children's Chronotype Questionnaire. Daytime drowsiness was assessed using the Sleep Behavior Questionnaire.

Results: Children's average sleep duration was 519.5 $\pm$ 66.9mins. Average sleep onset was 21:02($\pm$ 49.7mins) and average wake onset was 5:46($\pm$ 47.5mins). Sleep duration was longer on weekends (M=536.9mins) vs. weekdays (M=506.8mins; p=.001). Sleep onset was similar across all days, while wake onset was significantly later on weekends (6:07) vs. weekdays (5:29; p<.001). Only 21.6% of children obtained adequate sleep for their age (9-11hrs) according to WHO recommendations, yet none reported high levels of daytime drowsiness (M score=9.93, range: 5-16; possible range: 5-25). Sleep/wake onset were both earlier than averages found in prior research with similar-aged children, with only 8.8% falling asleep later than 22:00. Variability in sleep midpoint (SD) was low (M=34mins), with 11.7% of children experiencing sleep timing that varied >60 mins on average. For chronotype, children were primarily morning types (n=24, 70.6%).

Conclusion: While many children in this sample did not meet WHO recommendations for sleep duration, their sleep timing was earlier than other reports and with low night-to-night variability. This may be related to the consistency in day length in Ghana which may support their overall sleep quality. Future directions will explore impact of daylight exposure and other environmental factors (air/noise pollution) on children's sleep, along with continued data collection from more diverse SES neighborhoods in Accra.

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0120

INTERACTIONS BETWEEN TEMPERAMENT AND PARENT-CHILD RELATIONSHIP QUALITY IN EARLY CHILDHOOD AND SLEEP IN MIDDLE CHILDHOOD

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Introduction: Effects of child temperament on biopsychosocial outcomes, including sleep, are known to differ based on parent-child relationship quality (PCRQ). However, previous studies have primarily focused solely on early childhood, relied on subjective reports of PCRQ and sleep, and have neglected to examine variability in sleep, which is an important dimension of sleep health. We examined whether there were interactions between temperament and objectively measured PCRQ during early childhood in association with actigraphy measured sleep (average and variability) in middle childhood.

Methods: Participants included 90 preschoolers (mean age=4.24 years, SD=0.81) who were 47% female; 37% White, 17% Black, 47% other racial groups; and 46% Hispanic. Thirty-four percent experienced moderate to severe maltreatment. PCRQ was coded from a video-recorded free-play task between each child and their primary caregiver. Child temperament dimensions including Activity Level, Anger, Social Fear, Inhibitory Control, and Appropriate Attentional Allocation were measured with the parent-report Toddler Behavior Assessment Questionnaire. Child Mean and SDs of total sleep time (TST) and sleep efficiency (SE) were generated from actigraphy data collected for two weeks during a follow-up study when participants were ages 8-11.

Results: There were no direct effects of any of the temperament variables or PCRQ on sleep. In models adjusted for demographic characteristics and number of adversities experienced, greater attentional allocation was associated with greater average TST only among those children high in PCRQ (estimate = 20.59, 95% CI = 5.19, 35.99). For every one unit increase in attentional allocation score (possible range 1:7), there is a more than 20 min increase in mean TST. In contrast, greater activity levels were associated with better average sleep efficiency, only among those low in PCRQ (estimate = 2.35, 95% CI = 0.46, 4.24). For each unit increase in activity level score, there was a 2% increase in sleep efficiency.

Conclusion: Findings extend cross-sectional research in early childhood and provide support for models showing that children have differing susceptibility to the effects of temperament on sleep, depending on PCRQ.

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0121

NEWBORN HAIR CORTISOL AND SLEEP HEALTH IN INFANCY

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Introduction: Poor sleep health in infancy is linked to compromised physical and mental health in adulthood. As a result, identifying predictors of infant sleep health is essential for promoting lifelong health. A potential predictor that has been largely untested is fetal hypothalamic-adrenal-pituitary (HPA) axis functioning, which is linked to sleep behaviors and has been implicated in the development of sleep disorders. Cortisol, the end product of the HPA axis, may be important in regulating sleep during the early postnatal period. However, very little is known about the relation between fetal cortisol and offspring sleep in infancy. The current study aims to test the associations between neonatal hair cortisol, an index of fetal cortisol production in the third trimester, and sleep health in infancy.

Methods: Shortly after birth (M(days)=1.73, SD(days)=2.30), hair cortisol was collected from 70 infants (57.1% female) within the Care Project, a longitudinal study in Denver, Colorado. Participants did not receive exogenous glucocorticoids prenatally. Infant sleep health was assessed using parent report on the Brief Infant Sleep Questionnaire (BISQ) at 7 months of age. The BISQ includes measures of nighttime sleep duration, time spent in wakefulness during the night, number of night awakenings, and nighttime sleep onset latency. Partial correlations were conducted to examine the relation between newborn hair cortisol and sleep health, controlling for gestational age at birth and family income-to-needs ratio.

Results: Greater neonatal hair cortisol predicted longer sleep onset latency at 7 months ($r=.32$, $p=.017$), controlling for gestational age at birth and income-to-needs. Neonatal hair cortisol was not correlated with nighttime sleep duration ($r=-.17$, $p=.21$), nighttime wake duration ($r=.13$, $p=.36$), and number of night awakenings ($r=-.13$, $p=.32$).

Conclusion: Higher levels of fetal cortisol may negatively affect infant sleep health. Specifically, cortisol may inform the shift from multiphasic to monophasic sleep as well as the accumulation of sleep pressure throughout the day, impacting sleep onset latency. Future studies should consider the long-term effects of fetal cortisol production on sleep health in infancy and potentially later in life.

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0122

SLEEP MODERATES AROUSAL AND EXECUTIVE FUNCTIONING IN AUTISTIC CHILDREN

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Introduction: Arousal dysregulation (over- or under-arousal) and executive functioning (EF) difficulties are positively correlated and often experienced by autistic children. Arousal and task performance (e.g., EF) are connected, such that there is an optimal arousal level for an optimal performance and arousal dysregulation reduces task performance. Up to 80% of autistic children experience sleep problems, and sleep problems are positively correlated with arousal dysregulation and EF difficulties. Thus, sleep may moderate the relationship between arousal and EF in autistic children. Given that sleep is modifiable through behavioral sleep treatment, it is important to better understand these relationships in autistic children. This study examined whether subjective and objective sleep moderated the relationship between HRV and EF among autistic children.

Methods: Children with autism spectrum disorder (N=65), verbal IQ >70, and parent reported sleep complaints (Mage=8.95, SD=2.01, range 6-12; 74% male) completed 14 days of sleep diaries (with parental assistance) and actigraphy, Holter Monitoring (8-mins at rest), and the Connor's Continuous Performance Test (CPT)-III (ages 8+) or Connor's Kiddie CPT-II (ages 4-7.11). Multiple regressions (SPSS PROCESS) examined whether sleep (subjective/objective wake after sleep onset-WASO, total sleep time-TST) moderated associations between arousal (standard deviation of normal-to-normal R-R-intervals-SDNN, proportion of adjacent R-R intervals differing by >50 ms-PNN50) and EF (CPT-perseverations, omissions, commissions). Analyses controlled for age.

Results: Objective WASO moderated associations between SDNN and CPT-perseverations ($R^2=.27$, $p=.03$). At highest WASO, higher SDNN was associated with greater perseverations, $t(1,65)=5.00$, $p=.029$. Subjective TST moderated associations between PNN50 and CPT-perseverations ($R^2=.32$, $p=.01$). At highest TST, higher PNN50 was associated with greater perseverations $t(1,65)=4.27$, $p=.04$.

Conclusion: When autistic children sleep more and have greater sleep fragmentation, EF may suffer (i.e., greater response repetition) if arousal is not high enough. While our finding for sleep fragmentation (indicative of poor sleep) is consistent with existing literature, that for greater sleep (indicative of better sleep) is not. This suggests the relationships amongst these constructs are complex in autism, and more research using longitudinal and experimental methodology and perhaps even examining other aspects of TST (e.g., variability) are needed.

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0123

SLEEP PROBLEMS AND EXTERNALIZING BEHAVIORS FOR YOUTH IN JUVENILE JUSTICE FACILITIES

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Introduction: Adolescents who experience insufficient, poor quality sleep, and sleep problems might experience difficulties with externalizing behaviors including aggression and impulse control (Bauducco et al., 2019; Brown et al., 2022). Surprisingly, sleep and behavior for youth residing in long and short-term juvenile justice facilities is understudied. The present preliminary analysis explores self-reported sleep problems and aggressive and impulse control symptoms for youth under the care of the Department of Juvenile Services (DJS).

Methods: Participants (N=62, 86% male, mean age = 16.8, SD=1.2) were recruited from 11 DJS detention and treatment facilities in Maryland. Racial Backgrounds: 55% Black, 18% White, 14% Multiracial, and 12% Other. They completed an online questionnaire focused on sleep behaviors (daytime sleepiness, sleep-wake behavior problems) and daytime functioning including aggressive and impulse control behaviors (e.g., modified Aggression Questionnaire, Buss & Perry, 1992; Weinberger Adjustment Inventory, WAI, 1990). Using Pearson correlations, associations between sleep problems, daytime sleepiness and externalizing behaviors were examined.

Results: Self-reported daytime sleepiness and sleep-wake behavior problems were associated with increased aggressive and impulse control difficulties. Youth with more sleep-wake behavior problems reported higher levels of aggressive behaviors ($r = .39$, $p < .01$) and impulse control behaviors as measured by the WAI ($r = .33$, $p < .05$). Similarly, youth with high levels of daytime sleepiness also reported more impulse control behaviors ($r = .40$, $p < .01$).

Conclusion: Preliminary findings suggest that youth residing in juvenile justice facilities with sleep difficulties are more likely to report aggressive and impulse control challenges. Further analyses will provide a greater understanding of the modifying factors to better understand the youth's sleep-living environment.

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0124

THE INFLUENCE OF THE FAMILY ENVIRONMENT ON CHILDREN'S SLEEP DURING THE SCHOOL YEAR AND SUMMER

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Introduction: More than a third of US children do not receive adequate sleep. Earlier bedtimes, consistent bedtime routines, and good sleep hygiene help to support more adequate sleep. Our previous work has shown that during summer, 5-8-year-old

children go to bed later and obtain less sleep compared to the school year. We hypothesized that school year-summer differences in the family environment would explain differences in children's sleep timing during these periods.

Methods: During the school year and summer, 119 parents of 5–8-year-olds completed measures of child temperament, sleep hygiene, parenting practices, and parent stress and social support. Child sleep was measured for 8 days using wrist actigraphs. Sleep onset and offset were determined using the Sadeh algorithm and sleep diaries to determine sleep midpoint. Paired samples t-tests examined school year-summer differences in family environment variables and stepwise linear regression analyses were used to examine the effect of the family environment on sleep midpoint, controlling for age, gender, chronotype, and sleep duration.

Results: Compared to the school year, during summer parents reported less parent-child conflict before bed ($t(117)=3.913$, $p<.001$), less consistent bedtime routines ($t(117)=4.808$, $p<.001$), and average daily screen use ($t(117)=-2.756$, $p=.007$) and greater child surgency or impulsivity ($t(108)=-2.960$, $p=.004$). Overall, our model explained 48% of the variance in children's sleep timing during the school year ($p<.001$) and 45% during the summer ($p<.001$). In the final model, greater caffeine intake ($\beta=2.1$, $p=.033$), later chronotype ($\beta=0.4$, $p<.001$) and greater effortful control or self-regulatory skills ($\beta=0.2$, $p=.047$) predicted having a later sleep midpoint during the school year. During the summer, less consistent bedtime routines and later chronotype ($\beta=0.3$, $p=.002$) predicted having a later sleep midpoint ($\beta=-0.2$, $p=.022$).

Conclusion: The relaxed nature of the summer family environment likely contributes to decreased conflict over bedtime, increased child media use, and decreased bedtime routine consistency. However, only decreases in bedtime routine consistency contributed to later bedtimes during summer. Worryingly, 5–8-year-olds appear to be using caffeine during the school year contributing to later sleep timing. Addressing summer bedtime routines and children's school-year caffeine intake are important targets for intervention to improve children's sleep.

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0125

YOUTH SLEEP-WAKE EXPERIENCE IN JUVENILE JUSTICE FACILITIES: A DESCRIPTIVE ANALYSIS

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Introduction: With our knowledge of adolescents' sleep and circadian rhythms, it is striking that there is minimal research on

the sleep environment and sleep health of youth residing in juvenile justice facilities. Earlier findings from our group (Woodard et al., 2022) suggest that sleep-wake schedules and nighttime light exposure increase youth's likelihood for conditioned insomnia symptoms and/or circadian dysregulation. The aim of this qualitative analysis is to examine youth's perspectives about their sleep-living environment derived from brief semi-structured interviews.

Methods: Youth participants ($N = 19$, ages 13–20 years) were recruited from 6 Department of Juvenile Services (DJS) detention/treatment facilities in Maryland. For 7 consecutive mornings, youth completed a sleep diary reporting their bed/wake times, sleep onset, and type of (nocturnal) light exposure. After this week, youth were interviewed (virtual platform) about their experience with the study and their opinions on scheduling and environmental factors that they believe influenced their sleep during the previous 7 days. Based on the 8 interview questions, researchers created codes such as increased sleep knowledge, environmental disturbances, trouble with sleeping patterns, and light and environmental factors. Interviews were coded where 1 indicated the youth's response fell into one of the codes and zero indicated the response did not correspond with one of the codes.

Results: Interviews suggest that youth participated in the study to increase their knowledge about their sleep (47%). 63% reported that their sleep was better at home (e.g., later bed and wake times) than while residing in DJS facilities. Environmental factors such as light coming into the room (58%) and uncomfortable pillows and mattresses (37%) impacted their ability to sleep. Youth also reported that changing their sleep schedule to allow for sleeping longer in the morning would improve their sleep overall (63%).

Conclusion: Youth reported trouble sleeping in the facilities. Findings suggest that environmental factors such as light and noise make it difficult for youth to fall asleep and they desire later sleep-wake schedules. Further research is needed to evaluate how the environment can be modified to maximize sleep and circadian health in juvenile justice facilities.

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0126

CVD BIOMARKER PROFILING REVEALS DISTINCT RESPONSES TO ACUTE EXERCISE UNDER CONDITIONS OF RECURRENT SLEEP LOSS IN HEALTHY HUMANS

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Introduction: Physical exercise impacts a plethora of signaling pathways, which mediate the acute and long-term benefits of exercise. Whereas the acute effects of exercise on overall metabolism and cardiovascular disease (CVD) risk factors have been extensively studied in humans, little is known about how a wider range of CVD biomarkers change in response to acute exercise under conditions of sleep loss. Thus, here we examined whether a few nights of short sleep alter the diurnal and exercise-induced levels of a range of CVD biomarkers.

Methods: In a randomized two-condition crossover study, 16 men partook in two sessions, comprising three consecutive nights of full-night sleep (NS, 8.5 hours sleep/night) and three nights of partial sleep restriction (SR, 4.25 hours/night). In both conditions, blood was repeatedly sampled in the evening and about 12 hours later (for evening-to-morning analysis) as well as repeatedly before and after a 30-min bout of high-intensity exercise (at 75% VO₂max Reserve). Olink's CVD II panel and ELISAs were used to measure 92 CVD protein biomarkers.

Results: Under pre-exercise sedentary conditions, the diurnal changes of several CVD biomarkers differed in response to SR compared with NS. However, several proteins exhibited diurnal changes regardless of sleep condition (as also confirmed in a separate cohort with overnight wakefulness). In response to exercise, we observed that most proteins increased vs. decreased in their relative levels, including inflammatory markers. Furthermore, some proteins exhibited an early vs. more delayed increase. However, following SR, the exercise-induced induction of CVD biomarkers was markedly dampened, compared with the NS condition, and SR resulted in an altered exercise-induced response for several inflammatory-related CVD biomarkers.

Conclusion: Recurrent sleep restriction impacts the evening-to-morning dynamics of several CVD biomarkers, and the extent to which blood-based CVD biomarkers are induced by acute, high-intensity exercise. This may indicate that some of the cardiometabolic responses to vigorous exercise differ under conditions of sleep loss. Whether such changes alter the long-term benefits of aerobic exercise under conditions of chronic sleep loss, and whether these changes differ in e.g. older subjects or CVD, remains to be investigated.

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0127

EFFECTS OF PRE-SLEEP ALCOHOL CONSUMPTION ON SLEEP AND HEART RATE (HR)

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Introduction: Sympathetic nervous system (SNS) activity is relatively low, parasympathetic NS (PNS) relatively high, and heart rate (HR) is slow in NREM sleep. In tonic REM sleep, PNS activity remains high, but phasic REM sleep is associated with brief alterations of SNS/PNS balance along with irregular and phasic changes in HR. Alcohol elevates SNS activity, producing an overall increased HR during sleep. We propose to examine HR in NREM N2, N3, and REM sleep to determine whether the alcohol-related HR increase is present in these states.

Methods: 27 healthy adults [(mean ± SD) 32.8 ± 12.4 y, 13 women] completed the study. Participants kept a consistent 8-9hr sleep schedule at home followed by 2 nonconsecutive in-lab nights with order of alcohol vs. mixer counterbalanced. Alcohol condition included vodka + mixer (dose adjusted by sex/height/weight/age) to target peak breath alcohol concentration (BrAC) of 0.08 ± 0.02 g%; a non-alcohol mixer beverage was provided on the other night. Drinking occurred over 45 minutes ending one hour before lights out. Sleep recordings included EEG, EOG, EMG and HR from modified lead-I or II EKG placement. Sleep was scored in 30-sec epochs and matched to mean HR values.

Results: A statistically significant increase in HR following alcohol was found for N2 (t=5.24, p< 0.000; alcohol HR=67.22 ± 5.29, mixer HR=61.68 ± 5.00); N3 (t=3.43, p=0.002; alcohol HR=68.81 ± 4.32, mixer HR=62.26 ± 4.54); and REM sleep (t=4.54, p< 0.000; alcohol HR=70.00 ± 11.27, mixer HR=64.70 ± 6.53)

Conclusion: Overall, alcohol significantly increased HR in N2, N3, and REM sleep. We plan to examine whether this effect persists across three consecutive nights of pre-sleep alcohol and may vary with time of night.

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0128

MUSCLE INJURY INDUCES AN INCREASE IN TOTAL AND NREM SLEEP TIME

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Introduction: This study describes macro- and micro- sleep responses to a myotoxic skeletal muscle injury and investigates possible mechanisms.

Methods: We recorded the electroencephalogram(EEG)/electromyogram(EMG) of 24 wistar rats before and after induction of Tibialis Anterior muscle injury (n=8 per group: control, control +buprenorphine and injured). A top-down analysis of sleep characteristics was processed from total sleep time (TST), sleep stages, sleep stability, spectral-analysis, and spindles. To further investigate the mechanisms involved, we analyzed the protein level of sleep regulatory molecules including TNF- α , IL-1 β , IGF-1, BMAL1 in plasma, frontal cortex, hippocampus, and tibialis anterior, collected at Day +2 after injury from non-EEG/EMG implanted rats.

Results: Muscle injury induces a significant increase in total sleep time at 48 and 72h post-injury, specific to NREM sleep. These increases occur during the dark period and are associated with higher stability of sleep over 24h, without change in the different power/frequency spectral bands of NREM/REM sleep. There was no corresponding sleep increase in slow-wave activity or spindle density, nor were there changes in brain levels of the sleep-regulating proinflammatory cytokine IL-1 β , which is otherwise involved in the local response to injury. Conversely, decreased protein levels of brain IGF-1 and muscle BMAL1, a core circadian clock gene, after injury may play a role in increased sleep time.

Conclusion: Muscle injury induces an increase in total sleep time at 48- and 72-hours post-injury, specific to NREM sleep during the dark period in rats and is associated with higher sleep stability over 24 hours.

Support (if any):

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0129

DELTA-9-TETRAHYDROCANNABINOL (THC) INGESTION BEFORE BEDTIME REDUCES NOCTURNAL PARASYMPATHETIC CONTROL OF THE HEART

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Introduction: The use of cannabis as a sleep aid has increased despite inadequate evidence of its efficacy or associated risks. Delta-9-tetrahydrocannabinol (THC) is the primary psychoactive constituent of cannabis. Acute THC administration can induce CB1R mediated reductions in total peripheral resistance resulting in dose-dependent increases in heart rate and reductions in heart rate variability (HRV) in awake subjects. However, the influence of THC on vagal-cardiac modulation during sleep is unclear.

Methods: 7 individuals who use cannabis (>3x/week for 3 months; CUDIT-R = 8±1) and 8 cannabis-naïve participants (combined: age range 21-32 years; 9 female) were recruited to participate in this repeated measure, single blinded, placebo-controlled study. One hour before habitual sleep, participants received either a placebo pill or 10mg of THC. Polysomnography (PSG) and ECG were recorded over these 2 nights. HRV was assessed in both time and frequency domains in 2-min epochs of stable N2, N3 and REM sleep. Repeated measures ANOVA comparisons were made for PSG and HRV variables. [(*)=p<0.05]

Results: There were no significant changes in total sleep duration or sleep architecture (N2%, N3%, & REM%) between the placebo and dosing night in either group. Compared to the placebo night, both individuals who use cannabis and cannabis naïve participants exhibited significant decreases in HRV variables throughout the night when dosed with THC. R-R interval decreased by 25±10* ms [mean±SE] (2%) in the naïve group and 62±11* ms (6%) in the cannabis group. RMSSD decreased by 15±3* ms (22%) in the naïve group and 11±3* ms (23%) in the cannabis group. PNN50 decreased by 9±3* % in the naïve group and 11±3* % in the cannabis group. In naïve participants high frequency spectral power decreased by 398±76* ms² (32%).

Conclusion: Our results suggest that THC ingestion before bedtime did not systematically affect sleep depth or duration, but did significantly reduce vagal-cardiac modulation in individuals who use cannabis as well as in cannabis naïve participants. Acute reductions in parasympathetic control of the heart may indicate increased cardiovascular stress during sleep when THC is ingested.

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0130

REDUCED ENTROPY IN EEG DURING RAPID EYE MOVEMENT SLEEP IN MEN WITH DEPRESSION

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Introduction: Depression is an increasingly prevalent mental health condition. Patients with depression have disrupted rapid eye movement (REM) sleep as characterized by shortened REM latency, increased REM sleep duration, and increased REM density. However, it is unknown whether the dynamic patterns of EEG within REM episodes are altered in these patients. Here we investigated the complexity of EEG during REM sleep using the analysis of irregularity on multiple temporal time scales and compared the difference in such a nonlinear property of EEG between patients with depression and controls.

Methods: We analyzed the overnight EEG recordings (256 Hz) collected from the left central channel in 19 older men with depression and 19 age-matched otherwise healthy control men in the Osteoporotic Fractures in Men Study (MrOS) obtained from the National Sleep Research Resource (NSRR). To quantify the irregularity/complexity in EEG fluctuations during REM, a Multiscale Entropy (MSE) analysis was performed on each 30-second epoch to calculate the entropy at different time scales between ~0.004 and ~0.078 seconds (i.e., 1/256, 2/256, ..., 20/256 seconds).

Results: As compared to control men, men with depression had significantly lower entropy values at multiple time scales between 0.023-0.031 seconds (time scale =6/256 second: 0.363±0.008 [SE] for depression, 0.408±0.009 for controls; time scale =7/256 second: 0.295±0.009 for depression, 0.342±0.008 for controls; time scale =8/256 second: 0.225±0.009 for depression, 0.269±0.008 for controls; all FDR-adjusted P-values<0.001), indicating reduced temporal irregularity/complexity in EEG fluctuations. The differences were not statistically significant at smaller or larger time scales.

Conclusion: EEG complexity/irregularity within REM sleep were altered in patients with depression. Our results indicate the capability of MSE analysis in capturing important complexity features of EEG fluctuations, which might be missed using those entropy algorithms focused on EEG fluctuations at a single time scale.

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0131

SLEEP DEPRIVATION ALTERS TWO PHYSIOLOGICAL SYSTEMS' RESPONSES TO REPEATED STRESSORS DIFFERENTIALLY

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Introduction: The hypothalamic-pituitary-adrenal (HPA) and sympathetic-adrenal-medullary (SAM) axes activate in response to stressors. Real-world exposure to stressors often co-occurs with total sleep deprivation (TSD). The SAM response to a single stressor appears unchanged by TSD, but salivary alpha-amylase (sAA) has shown that TSD blunts the SAM response to repeated stressor exposure. Using salivary cortisol concentration

(SCC), we investigated the HPA response to repeated stressors under well-rested and TSD conditions.

Methods: N=10 healthy adults (ages 28.3 ± 5.78 ; 5f) completed a 4-day/3-night in-laboratory study with 38h TSD preceded and followed by 10h sleep opportunities. On day 2 (well-rested) and day 3 (TSD), participants completed two stressor sessions in a high-fidelity shooting simulator, separated by 30min. Acting as police officers, civilian participants verbally interacted with emergency response scenarios and decided whether to use (simulated) deadly force. Seven saliva samples were collected each day: pre-stressor, and 0min, 15min, and 30min after each session. Samples were assayed for SCC and normalized against each day's pre-stressor sample.

Results: Mixed-effects ANOVA showed a significant effect of sample time ($F[5,99]=19.85$, $p<0.001$), with SCC peaking 15min after the first stressor session and steadily declining thereafter. The SCC peak was significantly blunted during TSD compared to well-rested ($t[99]=2.84$, $p=0.006$). Correlations with previously reported, simultaneously assessed sAA concentrations, which peaked right after the first stressor session, were not significant ($p>0.2$). Additionally, whereas sAA showed a second peak after the second stressor session when participants were well-rested, no second peak was found in SCC.

Conclusion: The SCC response after one stressor session with simulated emergency response scenarios was blunted during TSD, unlike the sAA response. However, while sAA peaked twice in response to repeated stressor exposure when participants were well-rested (though not during TSD), SCC continued to decline after the first stressor exposure, potentially indicating a HPA refractory mechanism or habituation. Also, over participants there was no significant relationship between the magnitude of the stressor response between SCC and sAA. Taken together, our results suggest fundamentally distinct SAM and HPA axis responsiveness to repeated acute stressors, with differential impact of TSD. **Support (if any):** ONR N00014-13-1-0302, PRMRP W81 XWH-20-1-0442.

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0132

THE ROLE OF STRESS IN THE ASSOCIATION BETWEEN NEIGHBORHOOD ENVIRONMENT AND SLEEP

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Introduction: Adverse neighborhood characteristics have been associated with poor sleep health. However, the mechanisms through which the neighborhood environment influences sleep are not completely understood. We examined the role of perceived stress in the association between neighborhood environment and sleep.

Methods: Between 2010 and 2013, 2,001 Multi-Ethnic Study of Atherosclerosis (MESA) participants completed the Neighborhood and Sleep Ancillary studies. Neighborhood aesthetic quality and neighborhood social environment were measured among MESA participants and an independent sample of individuals living in the same neighborhood (defined as census tracts) using survey-based methods and geographic information systems at the census tract level. Responses from MESA participants and neighborhood informants were aggregated at the neighborhood level using empirical Bayes estimation to improve

reliability and precision. MESA participants completed 1-week wrist actigraphy, yielding measures of average sleep duration and sleep efficiency. Stress was measured using the 4-item Perceived Stress Scale. Multi-level linear regression models were fit to examine associations between neighborhood aesthetic quality or social environment, perceived stress, and sleep duration or efficiency.

Results: The average age of the study population was 68.5 years (standard deviation [SD]=9.10), and 54% were women. The average sleep duration and sleep efficiency were 388.9 minutes (SD=80.8) and 89.8% (SD=3.7), respectively. A SD increase in neighborhood aesthetic quality or social environment was associated with 6.02 (95% CI 1.89, 10.14) and 6.96 (95% CI 2.92, 11.00) minutes longer sleep duration, respectively, after adjusting for age, gender, race/ethnicity, study site, and socioeconomic and behavioral factors. Further adjustment for perceived stress attenuated the associations by 2.9-3.6% (neighborhood aesthetic quality: 5.80, 95% CI 1.68, 9.92; neighborhood social environment: 6.76, 95% CI 2.72, 10.80). Neighborhood environment and perceived stress were not associated with sleep efficiency.

Conclusion: Perceived stress had a modest 2.9-3.6% reduction in the association of neighborhood environment and sleep duration, thus suggesting a partial mediation. Future longitudinal studies with formal mediation analysis are needed to confirm these findings.

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0133

ADAPTING AND VALIDATING A MODERN SITUATIONAL MEASURE FOR DREAM CONTENT AND EXPERIENCE

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Introduction: Dream content is typically measured using self-reports which draw heavily on psychoanalytic theory. There is a need for a modern, reliable, validated, and comprehensive measure of dream content and experience. The DIAMONDS taxonomy has been developed and extensively validated by social/personality psychologists to assess psychologically salient features of waking situations. According to the continuity hypothesis, dreams reflect waking life; thus, this measure may also provide valuable information for dream content. We are adapting and validating this measure for dream content using self-reports and external raters.

Methods: We have begun an extensive construct validation process to adapt the DIAMONDS for dreams, including an extensive literature search and the development of a large item pool. Then, in a first preliminary study (N = 55), we examined the substantive validity by having an external rater code participants' dream narratives using the adapted DIAMONDS. Next, in a second preliminary study from an online sample (N = 74), participants self-rated their own dream narratives using the adapted DIAMONDS.

Results: We developed a preliminary item pool (41 items) covering five proposed dream-specific factors: dream continuity, plausibility, clarity, memory degradation, and physiology.

These items were added to the existing DIAMONDS. Results of the first preliminary study suggest all original DIAMONDS items have appropriate distributional properties when used to assess dream content; 20 of the newly developed items had abnormal skew and/or kurtosis. Items were modified; results of the second study show an improvement in the distributional properties of the adapted items. Notably, participants in the second study did not report an element of their dreams as being missing from the adapted DIAMONDS measure.

Conclusion: Thus far, we have gathered preliminary substantive validity evidence for the adapted DIAMONDS for dream content. Moving forward, we will evaluate whether the adapted measure predicts next day affect in a larger sample (predictive validity). In the long term, we hope to gather enough substantive, structural, and external validity evidence to validate the adapted DIAMONDS for dream content and experience.

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0134

ASSOCIATIONS BETWEEN PSYCHOLOGICAL RESILIENCE AND SLOW WAVE SLEEP IN HEALTHY ADULTS

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Introduction: Psychological resilience can be viewed as a personality trait, an ability to bounce back, or a positive outcome after life adversities. Although there have been increasing reports of the importance of sleep and circadian factors in contributing to an individual's resilience, current studies were devoid of objective measurements and in-depth analysis. Whether psychological resilience is related to the slow wave sleep that facilitates recovery processes is of particular interest. **Methods:** This study focused on the association between resilience and sleep in healthy young individuals free of physical and mental disorders. 160 young adults (61.7% female, mean age: 29.55±4.94) were included. Psychological resilience was defined as both a trait and a positive health outcome despite adversities. The trait resilience was measured by the Connor-Davidson Resilience Scale (CDRS-10), at which scores exceeding the 50th percentile of CDRS-10 were categorized as a "High resilient trait". The outcome resilience was measured by the residual score of the linear regression model with psychological health level as the dependent variable and accumulative adversities as the

independent variable. Those with a positive residual value were categorized as "Resilient outcome". The accumulative adversities included childhood adversities (e.g., emotional and physical neglect, sexual abuse) and lifetime stressors (e.g., accident, death of families or close friends). Sleep architecture was assessed by polysomnography, and sleep microstructure was computed by spectrum power analysis and slow wave sleep autodetection.

Results: Resilient participants had more slow wave sleep (SWS; N3%: 15.69% vs 12.89%, $p = 0.021$) and higher delta power in N3 (Absolute: 750.36 μV^2 vs 617.55 μV^2 , $p = 0.059$) than those non-resilient participants. Linear regression models showed that increased SWS was associated with higher resilient trait (SWS density: $B=0.25$, $p=0.006$; Absolute power of N3 delta: $B=0.003$, $p=0.004$) and resilient outcome (N3%: $B=0.02$, $p=0.058$; SWS density: $B: 0.03$, $p=0.073$; Delta power in N3: $B=0.0004$, $p=0.020$).

Conclusion: Psychological resilience was related to greater slow wave sleep. The findings suggested a critical role of sleep quality in maintaining psychological resilience. Longitudinal studies are need to examine the underlying mechanism of the link between resilience and slow wave sleep.

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0135

BETTER SLEEP QUALITY IS ASSOCIATED WITH CHARITABLE DONATIONS: DATA FROM TWO POPULATION-BASED SURVEYS

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Introduction: Insufficient sleep alters emotional processing, leading to impaired recognition and expression of emotions, greater endorsements of punishing behaviors, and withdrawal of compassionate helping. Using data from two national surveys, we investigated whether sleep quality and sleep duration were associated with willingness to donate to local charities, religious institutions, and political parties.

Methods: We conducted secondary analyses of two independent samples: Wave 5 and Wave 6 of the Baylor Religion Survey (BRS-5 and BRS-6). The BRS-5 included 1,501 participants (2017) and the BRS-6 included 1,248 participants (2021). Both surveys used random address-based sample methodologies to approximate population-representative samples, with stratification weighting targets matching national demographics for age, gender, race/ethnicity, education, and region. Each survey inquired about donations to local charities, religious institutions, and political parties. In addition, the BRS-5 included questions about sleep duration and sleep quality (restedness, sleep onset latency); BRS-6 only included questions about sleep quality.

Results: In the BRS-5, people were more likely to donate to a local charity and a religious institution if they had better sleep durations (charity: $p = .004$, OR = 1.39; institution: $p = .05$, OR: 1.45) and better sleep quality (charity: $p = .015$, OR=1.18; institution: $p = .003$, OR: 1.38). Some of these outcomes remained significant after controlling for income, age, gender, and race/ethnicity (e.g., institution donations and sleep quality: $p = .026$, OR = 1.30; sleep duration: $p = .05$, OR = 1.48). Similar outcomes emerged in the BRS-6, with better sleep quality being associated with more local charity donations ($p < .001$, OR=1.33), even after adjusting for income and demographic factors ($p = .029$, OR=1.19). Sleep

measures were not significantly associated with donations to political parties after adjusting for demographic factors.

Conclusion: Better sleep was associated with a greater likelihood to donate locally. There is likely a bidirectional relationship between sleep outcomes and prosocial behaviors.

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0136

DECREASED SLEEP EFFICIENCY MAY LINK ADVERSE CHILDHOOD EXPERIENCES WITH INCREASED VISCERAL ADIPOSITY

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Introduction: Poor sleep has been shown to negatively impact cardiometabolic health. Adverse Childhood Experiences (ACEs), potentially traumatic events occurring within the first 18 years of life, have been linked to both poor sleep and cardiometabolic disease in adulthood. Evidence is needed to understand whether poor sleep plays a mechanistic role in the link between ACE exposure and cardiometabolic risk. The purpose of this study was to examine associations of ACE exposure with self-reported sleep efficiency (SE%) and waist circumference (WC).

Methods: In 25 young adults (21F/4M; mean±SD, age=25±5 y), we assessed ACE exposure using the 10-item ACE Questionnaire and SE% as the reported average sleep duration relative to time-in-bed from the Pittsburgh Sleep Quality Index. We measured WC, a known cardiometabolic risk factor, as a surrogate of visceral adiposity. We used multiple linear regression analyses to examine associations between ACE exposure, SE%, and WC adjusted for sex. We then utilized ANCOVA analyses to examine the possible mechanistic effect of SE% on the relationship between ACE exposure and WC. For these analyses, participants with 0-1 ACEs were categorized as low-ACE exposure (ACE-low) and participants with 2+ ACEs were categorized as moderate-to-high ACE exposure (ACE-mh).

Results: Following adjustment for sex, ACE score predicted SE% ($\beta=-0.53$, $p=0.009$) and WC ($\beta=0.52$, $p=0.01$), and SE% predicted WC ($\beta=-0.44$, $p=0.03$). Similarly, ANCOVA analyses indicated that ACE-mh was associated with greater WC than ACE-low, adjusted for sex (adjusted means $\pm$ 95% CI, 0.86 ± 0.07 m vs. 0.78 ± 0.06 m; $p=0.049$). However, the effect of ACE group on WC was no longer significant following inclusion of SE% as a covariate (0.84 ± 0.07 m vs. 0.80 ± 0.07 m; $p=0.29$).

Conclusion: Both ACEs and sleep efficiency are associated with visceral adiposity. Further, SE% may serve as a mechanistic biobehavioral link between ACE exposure and increased visceral adiposity in young adults. These preliminary findings warrant further investigation with implications for sleep interventions as a possible preventative approach to reduce cardiometabolic risk in individuals exposed to ACEs.

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0137

THE EFFECT OF THE 2020 US PRESIDENTIAL ELECTION ON SLEEP AND ITS RELATIONSHIP TO PUBLIC MOOD AND ALCOHOL CONSUMPTION

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Introduction: Major events, such as the Super Bowl, World Cup, elections, and disasters can influence the general public's affective state in both positive and negative directions. More recently, evidence has indicated that other affect-related processes, such as sleep, may be similarly influenced, but the relationship between changes in sleep and emotion metrics in the wake of these significant events remains unknown. Here, we investigated the extent that a major sociopolitical event – the 2020 US presidential election – impacted sleep, measures of public mood and emotional well-being, and alcohol consumption. We also explored the relationship between changes in sleep, affect, and alcohol consumption during the peak period of election stress.

Methods: A non-representative, convenience sample of US-residing ($n = 437$) and non-US-residing ($n = 106$) participants were recruited online for participation as part of the Boston College COVID-19 Sleep and Well-Being Study (<https://osf.io/gpxwa/>). For the present analysis, participants were responded to daily surveys via email assessing their affect, sleep, and alcohol consumption during a baseline period (October 1-13, 2020) and in the days surrounding the 2020 US Election (October 30-November 12, 2020).

Results: Changes following the election were investigated separately for US and non-US participants. Election Day evoked a significant reduction in sleep duration and efficiency, coupled with heightened stress, negative affect, and increased alcohol use. While the impact was greater for US participants in a number of domains, non-US residents also reported sleep loss and increased stress on Election night compared to baseline. Across participants, changes in emotional well-being and alcohol consumption on Election Day correlated with changes in sleep metrics on Election Night.

Conclusion: These results suggest that major sociopolitical events can have global impacts on sleep that interact with significant fluctuations in public mood and well-being. Further, while the largest impact is on the local population, these results suggest that globalization may extend the effects beyond borders. These findings provide an ecologically-relevant example of the relationship between daytime mood and subsequent sleep and highlight the potential impact of future sociopolitical events on public well-being.

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0138

WITHDRAWN

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0139

IMPAIRED SLEEP MEDIATES THE RELATIONSHIP BETWEEN INTERPERSONAL TRAUMA AND SUBTYPES OF DELUSIONAL IDEATION

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Introduction: Impaired sleep is an important area of intervention, as improving sleep can have beneficial effects on co-existing psychopathology. Under this framework, impaired sleep is examined as a mediator between IT (IT; i.e., trauma caused by another) and subtypes of delusional ideation (i.e., subclinical delusions). Impaired sleep may be a maintenance factor of delusional ideation following IT. Thus, this study seeks to clarify the role of impaired sleep in different types of delusional ideation, which may inform future treatment research.

Methods: Transdiagnostic-community participants (18-60 years) were utilized from the Nathan Kline Institute (N=496). An exploratory factor analysis was completed for the Peter's Delusion Inventory (PDI) and extracted factors were used as DVs in separate mediation models. We assessed whether global sleep quality (GSQ) from the Pittsburgh Sleep Quality Index mediated the relationship between IT and subtypes of delusional ideation. GSQ is the summation of seven component scores: sleep duration, sleep disturbance, sleep latency, daytime dysfunction, sleep efficiency, subjective sleep quality, and medication use. Thus, specificity analyses examined each component of GSQ individually in mediation models to identify influential components.

Results: A three-factor solution of the PDI was identified: magical thinking, grandiosity, and paranoia. However, IT was only related to paranoia ($\beta=0.312, p<0.01$) and grandiosity ($\beta=0.286, p<0.01$). With GSQ as a mediator, the relationship between IT and paranoia was attenuated (direct effect=0.212, $p=0.046$; indirect effect=0.074, $p<0.01$; 25.9% mediated). Similarly, the relationship between IT and grandiosity was attenuated by GSQ as a mediator, but less variance was accounted for (direct effect=0.269, $p=0.013$; indirect effect=0.044, $p=0.035$; 14.1% mediated). Specificity analyses highlighted that for paranoia, the components of sleep disturbance (direct effect=0.121, $p=0.220$; indirect effect=0.165, $p<0.01$) and daytime dysfunction (ab=0.073, $p=0.035$; c=0.214, $p=0.030$) provided significant mediation of the relationship with IT. For grandiosity, only the sleep disturbance component (ab=0.092, $p=0.011$; c=0.221, $p=0.043$) mediated the relationship with IT.

Conclusion: In conclusion, impaired sleep significantly mediated the relationship between IT and paranoia, as well as grandiosity. This provides support for future research investigating impaired sleep as a target to improve specific subtypes of delusional ideation following IT, particularly paranoia. While our findings align with previous research, several limitations are considered including cross-sectional data and use of self-report measures.

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0140

NIGHTMARES ARE ASSOCIATED WITH INCREASED SUICIDALITY IN YOUNG ADULTHOOD: A POPULATION-BASED COHORT STUDY

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Introduction: Childhood nightmares have a second increase in incidence in young adulthood, which has been attributed to trauma and psychopathology. As suicide rates are high in young adults and have been associated with nightmares, more research is needed regarding this relationship in this age range. This study aimed to examine the association of nightmares, independent of sleep disturbances, insufficient sleep or trauma-history, with suicidality in young adulthood.

Methods: The Penn State Child Cohort is a random, population-based sample of 700 children (5-12 years at baseline) studied in the sleep laboratory who returned for follow-up visits during adolescence and young adulthood. For the current study, 258 young adults (25.1 ± 2.7 years old, 53.9% female, 24.8% racial/ethnic minority) completed their follow-up visit 15.9 ± 2.0 years later. Nightmares were ascertained by self-report. The presence of suicidality was ascertained from responses on items querying suicidal ideation and/or attempts via clinically-relevant sources (i.e., MINI structured interview, Child Behavior Checklist Adult Self-Report, and Depression Anxiety and Stress Scale). General linear and logistic regression models adjusted for important covariates.

Results: Subjects reporting nightmares ($n=109$) had a significantly higher rate of suicidality (29%) than those absent of nightmares (14%; $p=0.002$), after adjusting for sex, age, sleep disturbances, sleep duration and trauma history. This rate was even higher (46%) in those reporting moderate-to-severe nightmares ($n=24$; $p<0.01$). The odds of suicidality associated with nightmares were 2.3-fold (95%CI=1.1-4.7), after adjusting for sex, age, sleep disturbances, sleep duration and trauma history ($p=0.023$); a risk that increased to 6.1-fold (95%CI=2.0-18.6) in those reporting moderate-to-severe nightmares ($p=0.001$).

Conclusion: These findings further strengthen previous research that has established nightmares' significant relationship to increased suicidality, even when controlling for other important risk factors such as sleep disturbances and trauma history. Furthermore, as these results come from a random, population-based sample, it also demonstrates the generalizability of the association between nightmares and suicide. As the search for effective prevention strategies for suicide continues, it will be important to assess for the presence and severity of nightmares in those who express suicidal ideation, especially given the treatable nature of nightmares.

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0141

SHORT-TERM STABILITY OF SLEEP PARAMETERS IN COMORBID NIGHTMARES AND CHRONIC INSOMNIA DISORDER

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Introduction: Nightmares are highly comorbid with insomnia and have been associated, yet not consistently, with distinct polysomnographic (PSG) disturbances, such as reduced total sleep time (TST), sleep efficiency and slow wave sleep as well as increased nocturnal awakenings and wake after sleep onset

(WASO) or abnormal REM sleep. However, most prior studies have relied on a single night of PSG and the degree of stability of sleep parameters or overall differences between individuals with nightmares comorbid with insomnia disorder (NCI), individuals with chronic insomnia disorder (CID) and otherwise good sleeping controls (GSC), remain unknown. Therefore, the aim of this study was to determine if there were significant differences amongst these aforementioned groups in the way their sleep changes across time while being studied in the lab.

Methods: A total of 142 GSC, 126 CID and 24 NCI participants underwent 8-hour PSG recordings for 4 consecutive nights. Outcomes included sleep continuity, architecture, and REM-related parameters across nights 1 through 4. Intraclass correlation coefficients (ICC) with mixed-effect variances and repeated-measure analysis of variance (ANOVA) were used to determine short-term stability as well as between-subjects and time-by-group interaction effects, respectively.

Results: ICC were similar across groups on all outcomes (ICCs>0.6) except that the NCI group did not display stability for WASO, stage 1 sleep, REM latency or REM interval. There were no significant time-by-group interaction effects on PSG parameters ($p>0.05$). There were significant between-group effects for SOL, number of awakenings, WASO, TST, REM latency, and number of REM episodes (all $p<0.05$), where the NCI group showed significantly longer SOL (58.10 ± 11.08), shorter TST ($6.64\text{ hours}\pm1.02$), and less REM episodes (3.81 ± 0.76).

Conclusion: This study suggests greater night-to-night variability and overall disturbance in nighttime sleep continuity and REM sleep in individuals with NCI. These disturbances may be attributed to the occurrence of nightmares, causing wakefulness out of REM sleep, as well as a greater level of hyperarousal as evidenced by the greater SOL and reduced TST, relative to the other groups. These data also suggest the utility of objective sleep measures in nightmare research and clinical practice alike.

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0142

TOO TIRED TO SLEEP: A SOCIAL-ECOLOGICAL EXPLORATION OF INSOMNIA IN APPALACHIAN WOMEN

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Introduction: Appalachian Kentucky contains numerous “hotspots” of insufficient sleep where 25-58% of adults report insufficient sleep 15+/30 nights. Insomnia, a leading cause of insufficient sleep, is present at higher-than-average rates among the NIH-designed health disparity population of Appalachian adults. Given the strong, bi-directional relationship between sleep and health, a better understanding of insomnia in this population is critical. This study focuses on the gender (women) and age group (45+) at highest risk of insomnia and builds on previous qualitative work exploring the intersections of gender and sleep.

Methods: Participants (N=46) were Appalachian females ages 45+ who self-reported difficulty falling/staying asleep ≥ 3 nights a week for ≥ 3 months and used prescription or over-the-counter sleep aids ≥ 3 months. Semi-structured telephone interviews were recorded with permission and professionally transcribed. The social-ecological model of sleep served as an interpretive

framework. We used a multi-stage, inductive coding process informed by grounded theory and aided by NVIVO 12.0 software.

Results: Participants most commonly cited social-level issues as insomnia-initiating and perpetuating factors. Caregiving, loss of loved ones, and trauma were prevalent, and often experienced simultaneously. For instance, the death of a child resulted in several participants raising their grandchildren. Caregiving stress, and bed-sharing with, grandchildren perpetuated insomnia. Regional and societal norms (e.g., kinship and gender norms) exacerbated participants' stressors. Secondly, women cited a combination of individual-level (e.g., menopause) and/or societal-level (e.g., using technology before bed) insomnia factors.

Conclusion: Our findings illuminate social processes, social structures, and individual-level factors that contribute to the initiation and perpetuation of insomnia among middle-aged Appalachian women. Our data support previous findings that women in this region are more likely than their non-Appalachian peers to raise their grandchildren, while highlighting this kinship arrangement's insomnia contributions. These insights may aid health care providers and policy makers aiming to address sleep disparities among the health disparity population of rural Appalachian women.

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0143

TRAIT EMOTION REACTIVITY PREDICTS CHANGE IN NEGATIVE BUT NOT POSITIVE AFFECT DURING TOTAL SLEEP DEPRIVATION

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Introduction: During laboratory-based, voluntary exposure to total sleep deprivation (TSD), relatively large decreases in positive mood and relatively small increases in negative mood have been observed, with the magnitudes of change varying across individuals. People differ in their trait emotion reactivity, i.e., their sensitivity to emotion-evoking stimuli or events. As higher reactivity is associated with greater difficulty regulating emotion, we hypothesized this trait could moderate mood changes during TSD.

Methods: N=96 healthy adults (ages 21-38, 47% female) participated in one of three 4-day/3-night in-laboratory TSD studies. In each study, after 10h baseline sleep, participants were exposed to 38h TSD, followed by 10h recovery sleep. Participants completed the Emotion Reactivity Scale (ERS), and their self-reported affect was assessed every 2-4h during wake using the Positive and Negative Affect Schedule (PANAS). The 11 test bouts during TSD shared across studies were included in analyses (day 2: 09:00, 13:00, 21:00, 23:00; day 3: 01:00, 03:00, 05:00, 07:00, 09:00, 13:00, 21:00). Positive and negative affect ratings were analyzed with linear mixed-effects regression with fixed effects of test bout (categorical), ERS score (continuous), and their interaction, covariates for study, sex, and age, and a random intercept over participants.

Results: Participants showed the expected decrease in positive affect as a function of test bout (time awake and time of day, $p<0.001$), and a smaller, non-significant increase in negative affect ($p=0.17$). Higher ERS scores were associated with increased negative affect during TSD ($p=0.002$), but this effect was small, and negative affect

showed a floor effect. Emotion reactivity was not a significant predictor of decreased positive affect during TSD ($p=0.97$).

Conclusion: As hypothesized, emotion reactivity predicted individual variability in negative affect during TSD, but unexpectedly it did not predict the decrease in positive affect associated with TSD. This suggests that the trait measured by the ERS may be biased toward negative affect, and/or that positive affective changes may be more difficult to predict during the low arousal state induced by TSD. Studies inducing greater variability in negative affect during TSD (e.g., through exposure to a stressor) are needed to confirm our findings.

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0144

A MIXED METHODS EXPLORATION OF STIGMA, DISCRIMINATION, AND SLEEP AMONG INDIVIDUALS ON MEDICATION FOR OPIOID USE DISORDER

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Introduction: Many individuals who suffer from opioid use disorder (OUD) experience symptoms of insomnia. OUD-related stigma and discrimination are major concerns and represent complex, chronic stressors that lead to negative health and social outcomes. However, how OUD-related stigma and discrimination are associated with insomnia among those on Medication for OUD (MOUD) is not known. The purpose of this study is to examine the associations among OUD-related stigma, intersectional discrimination, and insomnia among patients on MOUD. **Methods:** This concurrent mixed methods study is a sub-study ($N = 120$) of the NIH funded Collaboration Linking Opioid Use Disorder and Sleep (CLOUDS) study. Insomnia was measured with the Insomnia Severity Index. OUD-related stigma was assessed with the Brief Opioid Stigma Scale, and intersectional discrimination was assessed with the Intersectional Discrimination Index. Quantitative data were analyzed via Spearman correlations. A sub-sample of 25 participants participated in semi-structured interviews. Qualitative questions explored individuals' perceptions and experiences of stigma and discrimination and their influence on sleep. Qualitative data were analyzed with thematic analysis.

Results: Hypotheses were partially supported. Spearman correlations revealed a small positive correlation ($r = .17$, $p = .04$) between intersectional discrimination and insomnia severity. Correlations between OUD-related stigma and insomnia severity were not statistically significant. Patterns of negative thinking and rumination were described by participants who felt their stigmatizing and discriminatory experiences affected their sleep.

Conclusion: Findings add to the growing literature linking discrimination to sleep deficiency in highly stigmatized populations. With larger diverse samples, future researchers should (1) utilize longitudinal designs to explore underlying pathways by which discrimination and stigma affect sleep and (2) identify intervention approaches that target multiple levels [individual, interpersonal, community, and structural] to decrease the impacts of discrimination and stigma on self-perception and sleep outcomes for those battling OUD.

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0145

ASSOCIATIONS AMONG CHILDHOOD STRESS, ACTIGRAPHY-MEASURED SLEEP EFFICIENCY, AND FASTING GLUCOSE CONCENTRATIONS IN YOUNG ADULTS

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Introduction: Psychosocial stress exposure during the first 18 years of life promotes adverse sleep and cardiometabolic health effects. The purpose of the study was to investigate the relationships between childhood stress (CS), sleep efficiency (SE), and fasting glucose levels (FG) in young adulthood.

Methods: In 24 adults between the ages of 18 and 35 years (83% Female; mean $\pm$ SD, age = 24 ± 5 y), CS was assessed using a retrospective childhood stress assessment and averaged across reference ages of 5, 10, and 15 years old. FG concentrations were obtained from whole blood samples and SE was assessed using an actigraphy device (ActTrust2) worn on the wrist for 7 days, yielding ≥ 6 days of sleep data. Zero-order correlations were used to investigate the relationships among CS, SE, and FG. Multiple linear regression analyses were used to examine the effect of CS and SE on FG controlling for sex. To explore preliminary indications of a mechanistic effect of SE on the link between CS and FG, ANCOVA analysis was used. Participants were grouped as either low CS (CS-low) or high CS (CS-high), and analyses were completed with sex as the only covariate and sex and SE as covariates, with FG as the outcome.

Results: CS was associated with FG ($r=0.50$, $p=0.01$) and SE ($r=-0.41$, $p=0.47$), and SE with FG ($r=-0.45$, $p=0.03$). The association of CS with FG ($\beta=0.51$, $p=0.016$) and SE ($\beta=-0.43$, $p=0.046$) remained with adjustment for sex. ANCOVA analyses confirmed the effect of CS on FG, where FG was higher in CS-high than CS-low with adjustment for sex (92.4 ± 4.8 vs. 83.6 ± 5.4 mg/dL; $p=0.008$). Additional adjustment for SE reduced the difference between CS-high and CS-low, but this difference remained significant (91.6 ± 5.0 vs. 84.5 ± 5.5 mg/dL; $p=0.044$).

Conclusion: CS is linked with elevated FG and low SE in young adults. Our preliminary data suggest that SE warrants further examination as a potential mechanism by which CS relates to FG, but larger sample sizes will be necessary to draw definitive conclusions.

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0146

ASSOCIATIONS BETWEEN MOOD AND SLEEP ARCHITECTURE IN SEDENTARY OFFICE WORKERS

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Introduction: Sleep, and rapid eye movement (REM) sleep in particular, has been suggested to play an important role in mood

regulation. Currently, most of this research has come from laboratory settings under constrained conditions; less is known about one's sleep in their own home. The purpose of this study was to further examine the associations between home-based polysomnography (PSG) sleep parameters and mood disturbance.

Methods: This cross-sectional study used baseline data from 120 inactive adults with desk-based jobs (52.5% female, 43.8 ± 10.7 y) who were enrolled in an ongoing clinical trial. Mood was assessed using the Profile of Mood States (POMS); its 7 subscales (tension, anger, fatigue, depression, esteem-affect, vigor, confusion) were summed (with a constant of 100) to generate a Total Mood Disturbance (TMD) score with a higher score indicating greater TMD. Sleep stages were assessed after a full workday using one night of at-home PSG. Multiple linear regression models examined associations between sleep stages and mood adjusting for age, gender, and whether the assessment occurred pre- or post-COVID-19 emergence.

Results: The mean TMD score was 98.6 ± 18.3 . On average, participants slept for 397.4 ± 60.0 minutes with a sleep efficiency of $84.6 \pm 9.1\%$. The mean percentage of time spent in REM sleep was $22.5 \pm 6.6\%$; the mean percentage of time spent in non-rapid eye movement (NREM) sleep, stage 1 (N1), stage 2 (N2), and stage 3 (N3) sleep were $7.8 \pm 5.0\%$, $53.7 \pm 10.1\%$, and $16.0 \pm 9.1\%$, respectively. A greater percentage of REM sleep was associated with lower TMD ($\beta = -0.22$, $p = 0.01$). A greater percentage of N1 sleep was also associated with lower TMD ($\beta = -0.23$, $p = 0.01$). However, neither percent of N2 nor N3 sleep were associated with TMD ($p = 0.10$ and $p = 0.12$, respectively).

Conclusion: Overall, the findings of this study support current literature that suggests REM sleep plays a significant role in mood regulation. They also suggest, aside from N1 sleep, NREM sleep may not impact mood disturbance. In the future, the effects of sleep architecture on mood disturbance could further be explored through randomized controlled trials.

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0147

DOES SLEEP REGULARITY LINK CHILD MALTREATMENT TO DEPRESSIVE SYMPTOMS AMONG INCOMING FIRST-YEAR COLLEGE STUDENTS?

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Introduction: Sleep patterns may partially account for associations between early life adversity and poor health outcomes; however, few studies have empirically tested this hypothesis. We examined whether an index of sleep regularity mediated associations between child maltreatment (CM) and depression symptoms among emerging adults undergoing the major life transition of starting college.

Methods: First-year college students ($N = 731$; 41% male; 48% Non-Hispanic White, 21% Non-Hispanic Asian, 15% Hispanic all races, 5% Non-Hispanic Black, and 11% Non-Hispanic other races) completed daily sleep diaries (DSDs) for 9 weeks and completed the Childhood Trauma Questionnaire (CTQ) and Center for Epidemiologic Studies Depression Scale (CES-D) following DSD completion. DSD data were used to compute participants' Sleep Regularity Index (SRI). We used a nonparametric SEM bootstrap approach to examine whether sleep regularity mediated associations between childhood trauma and depressive symptoms, controlling for sex, race/ethnicity, and US vs. international status. Separate models were run for CTQ total score and five CTQ subscale scores: emotional, physical, and sexual abuse, and physical and emotional neglect.

Results: The prevalence of moderate to severe CM was 20.7%, and 40% reported clinically significant depressive symptoms at the end of the assessment period. Significant indirect effects of CTQ total score (estimate=0.02, 95% CI=0.003, 0.036); emotional abuse (0.06 [0.004, 0.107]); physical abuse (0.08 [0.003, 0.164]); sexual abuse (0.06 [0.014, 0.114]); emotional neglect (0.04 [0.002, 0.075]) on greater depression symptoms through lower sleep regularity were observed; and we saw no significant indirect effect of physical neglect (0.04 [-0.015, 0.089]). The percentage of the total effect of CM (i.e., CTQ total score and subscale scores) on greater depressive symptoms accounted for by lower sleep regularity were CTQ total score: 6%; physical abuse: 24%; sexual abuse: 19%; emotional abuse: 7%; and emotional neglect: 5%.

Conclusion: Variable sleep patterns account, in part, for associations between CM and depressive symptoms among first-year college students, with the largest effects observed for physical and sexual abuse. Sleep regularity should be included as a target in student health interventions on college campuses and may help buffer against poor mental health outcomes for students with CM.

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0148

EARLY DIAGNOSIS OF POST-TRAUMATIC STRESS DISORDER IN NURSES BASED ON PHYSICAL BEHAVIOR AND SLEEP ACTIGRAPHY USING MACHINE LEARNING

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Introduction: Disturbances in sleep/wake patterns and circadian rhythms are common in post-traumatic stress disorder (PTSD). Nurses are one population particularly susceptible to both sleep/circadian disruption and PTSD, given they frequently engage in shift work and experience high occupational stress. However, the specific types of sleep and circadian disruptions in PTSD have not been identified in nurses using validated measures of sleep, limiting potential intervention efforts.

Methods: To address this gap, we developed a machine learning algorithm for calculating risk of PTSD in nurses based on sleep, light, and physical activity patterns derived from actigraphy, in conjunction with inflammatory biomarkers. Participants

were 392 nurses (mean age = 39.54, 92% female, 78% White) recruited from two Dallas-area hospitals for a larger longitudinal study on sleep and vaccine response. At baseline, nurses reported on demographics and PTSD symptoms using the PTSD Checklist for DSM-5 (PCL-5). Nurses were categorized as having probable PTSD if they reported scores >31 on the PCL-5. Nurses wore actigraphy devices for two weeks to track sleep/wake, activity counts, and light exposure. In the middle of the two-week period, nurses also had a blood draw to determine inflammatory markers interleukin-6 (IL-6), C-reactive protein (CRP), tumor necrosis factor-alpha (TNF- α), IL-1 beta (IL-1 β), and interferon gamma-induced protein 10 (IP-10).

Results: 4.7% of nurses met criteria for probable PTSD. Using the actigraphy and inflammatory biomarker data, a Recurrent Neural Network (RNN) was developed to detect PTSD risk. Furthermore the Ridge Classifier was tested using activity counts, light exposure, and sleep/wake data to obtain an accuracy score of 0.97 and an F1 score (ranging between 0 and 1) of 0.96, indicating that the model was able to balance and maximize precision and determine PTSD risk successfully.

Conclusion: Using a novel machine learning algorithm, we show that actigraphy data can be used to accurately and non-invasively detect PTSD risk among nurses. Although additional validation is needed, results tentatively highlight the utility of harnessing real-time data to inform just-in-time adaptive interventions for PTSD among nurses. Given the essential role nurses play in the healthcare system, finding ways to support their well-being is of critical public health importance.

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0149

EMOTION DYSREGULATION AND SLEEP DISTURBANCES IN TRAUMA-EXPOSED COLLEGE STUDENTS

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Introduction: Trauma-exposed individuals are at risk of developing symptoms of posttraumatic stress disorder (PTSD), which has been linked to both sleep disturbances and sleep-related daytime impairment. A growing body of literature suggests affective processes, such as negative and positive emotion regulation, may influence associations between PTSD and sleep. Therefore, our study aimed to examine if there was a direct effect of negative and positive emotion dysregulation on sleep disturbances and sleep-related impairment above the influence of PTSD symptoms.

Methods: Participants were 460 trauma-exposed college students (69.8% female; 62.0% White; Mage = 20.13 $\pm$ 2.94) recruited from the University of North Texas. Trauma exposure was assessed with the Life Events Checklist for DSM-5. Participants completed demographic questionnaires, the PTSD Checklist for DSM-5 (excluding sleep-related questions), the Difficulties in Emotion Regulation Scale (DERS-16), the Difficulties in Emotion Regulation – Positive (DERS-P), the PROMIS Sleep Disturbance (PROMIS-SD), and Sleep-Related Impairment (PROMIS-SRI) Short Forms. Multiple regression models with robust standard errors were conducted to examine associations between both positive and negative emotion dysregulation on sleep disturbances and sleep-related impairment, covarying for PTSD symptoms, age, gender, race, and ethnicity.

Results: Greater negative emotion dysregulation was associated with greater sleep disturbances ($b = 0.06$, $SE = 0.03$, $p = .015$, $\eta^2 = 0.01$) above the influence of positive emotion dysregulation, PTSD symptoms, age, gender, race, and ethnicity ($R^2 = 0.28$). Greater negative emotion dysregulation was also associated with greater sleep-related impairments ($b = 0.20$, $SE = 0.03$, $p < .001$, $\eta^2 = 0.08$) above the influence of the same covariates ($R^2 = 0.31$). Positive emotion dysregulation was not associated with sleep disturbances or sleep-related impairments.

Conclusion: Results suggest that more difficulty regulating negative emotions is linked to disturbed sleep among trauma-exposed individuals. Additional experimental work is needed to understand if regulating negative emotions via cognitive-behavioral strategies (e.g., mindfulness, cognitive restructuring) can lead to downstream improvements in sleep.

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0150

INCREASED PREVALENCE OF CLINICAL DEPRESSION IN LATE TEENS WITH SLEEP COMPLAINTS

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Introduction: Adolescent mental health is becoming clinical attention since suicide is one of the leading causes of death in late teens. Depression and sleep are interconnected, since depression affects sleep, vice versa. Clinical depression with symptoms of sleep disturbance were interviewed by a board certified psychiatrist following depression inventory. Age, sex matched adolescents were also accessed by depression inventory scales.

Methods: 71 adolescence aged from 16-18 (M:F=1:1) who visited sleep disorders clinic for their complaints of daytime sleepiness, sleep initiation problems, snoring, frequent midnight awakenings. 29% of them diagnosed with narcolepsy, 21% delayed sleep phase syndrome, 19% obstructive sleep apnea syndrome, 15% of them had chronic insomnia. Some of them have multiple sleep disorders associated diagnosis like OSA + narcolepsy, OSA + insomnia, or DSPS + OSA. 21 aged, sex matched high school students were evaluated for their anxiety and depression symptoms.

Results: Patients with sleep complaints had higher level of emotional distress compared with healthy adolescents without sleep complaints. Among sleep disorders, patients with narcolepsy had higher level of depression. These explains why children or adolescents with narcolepsy are initially misdiagnosed with depression in clinical setting. Comorbid depression and narcolepsy should be differentiated in clinical field.

Conclusion: In adolescents, patients with sleep disorders especially with narcolepsy have higher level of depression. Misdiagnosis of narcolepsy as depression may delay narcolepsy diagnosis.

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0151

MODULATING EMOTION REGULATION AND THE LATE POSITIVE POTENTIAL ERP COMPONENT THROUGH SLEEP EXTENSION

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Introduction: Sleep deprivation and poor sleep quality reduces functional connectivity between prefrontal cortical networks and the amygdala, thus causing emotional dysregulation. In contrast, sleep extension in the form of napping has been shown to impact emotional memory consolidation and emotional reactivity. To date, however, the role of napping in adult emotion regulation has yet to be determined. We hypothesize that sleep extension in the form of a nap will improve emotion regulation abilities in healthy adults.

Methods: In this within-subjects design, participants completed an emotion regulation task following either a nap or an equivalent bout of wake time (separated by ~1 week, order counter-balanced). In the task, participants were shown negative and neutral IAPS pictures, and were instructed to suppress, maintain, or enhance their emotional experience. During the task, the late positive potential was assessed at Pz, a component that may reflect downstream neurobiological effects of amygdala activation.

Results: Participants were able to use the cognitive reappraisal strategy to alter their emotional valence ($F(2,14)=17.781$, $p<0.001$, $\eta^2=0.718$) and arousal ($F(2,14)=36.995$, $p<0.001$, $\eta^2=0.841$) according to the instructions. While not significant due to small sample size, participants showed greater mean amplitude in the late LPP component (1,900-3,000ms) for negative images compared to neutral images ($F(1,5)=3.165$, $p=0.135$, $\eta^2=0.367$), and in the wake condition compared to the nap condition ($F(1,5)=2.894$, $p=0.150$, $\eta^2=0.388$). Following instructions, there was a non-significant interaction between condition and the maintain and suppress instructions ($F(1,5)=2.357$, $p=0.185$, $\eta^2=0.320$); compared to the nap condition, in the wake condition participants averaged greater mean amplitude of the LPP (300-5,000ms) in the suppress condition.

Conclusion: Data from this study followed predicted directions that sleep extension in the form of a nap may help to improve emotion regulation by increasing top-down control of amygdala activation.

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0152

NATURAL DISASTER EXPERIENCES AND THEIR VARYING IMPACT ON SLEEP IMPAIRMENT

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Introduction: As rates and severity of natural disasters increase due to climate change, it is crucial to consider their effects on mental health. Among Hurricane Katrina survivors, stressors experienced following the Hurricane, including financial losses, were more robustly predictive of rates of PTSD than traumatic experiences occurring during the Hurricane (Galea et al., 2008). Because sleep disturbance is intimately associated with trauma exposure and has been implicated in the etiology of PTSD, we examined relationships between experiences during and after Hurricane Harvey (a historic storm that hit Texas in 2017) and sleep disturbance in sample of college students impacted by the storm.

Methods: Undergraduate students ($N = 191$, age: $M = 21.25$, $SD = 3.14$) at the University of Houston completed online

surveys 6-8 months after Hurricane Harvey. Sleep quality was measured using the Pittsburg Sleep Quality Index (PSQI) and post-traumatic stress (PTS) symptoms were measured using the PTSD Checklist for DSM-5, excluding sleep items. Participants also reported on experiences/events during, immediately after, and in the weeks/months following the Hurricane. Total traumatic experiences during the Hurricane (e.g., thinking oneself or others would get hurt or die) and stressful experiences after the storm (e.g., losing power, damage to car or property) were calculated. Financial stress was examined as a unique predictor. Analyses controlled for total traumatic life events measured with the Life Events Checklist for DSM-5.

Results: In a multiple linear regression model, we tested whether traumatic experiences during, stressors after, and financial stressors due to the Hurricane predicted global PSQI score, controlling for other traumatic life experiences and total PTS symptoms. The overall model was significant ($R^2 = 0.22$, $F(5,185) = 10.48$, $p < .000$). Traumatic experiences during the Hurricane ($B = 0.37$, $p = 0.04$), but not stressors ($B = 0.02$, $p = 0.87$) or financial stress ($B = -0.29$, $p = 0.67$) following the Hurricane significantly predicted poor sleep quality at present.

Conclusion: Our findings suggest that among a sample of young adult college students impacted by Hurricane Harvey, traumatic experiences during the storm were the most robust predictor of sleep disturbance several months later even after accounting for PTS symptoms.

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0153

OVERCOMMITMENT TO WORK IMPACTS THE RELATIONSHIP BETWEEN EFFORT-REWARD IMBALANCE AND INSOMNIA DIFFERENTLY FOR PHYSICIANS AND NURSES

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Introduction: Occupational stress is a predictor of sleep problems. Recovery from it by detaching yourself from work-related issues outside of work hours is crucial for sleep health. Shift workers, especially in healthcare, are at a higher risk of sleep problems, which may lead to fatigue and errors at work, impacting patient care. The aim of the study was to 1) verify whether overcommitment to work is a moderator of the relationship between occupational stress and insomnia symptoms, and 2) check if this moderation is impacted by an individual's occupation – whether overcommitment impacts the relationship of occupational stress and insomnia symptoms the same way for the two biggest occupational groups in healthcare in Poland – physicians and nurses.

Methods: Participants provided information on their occupation and filled in the Effort-Reward Imbalance questionnaire (ERI) with the Overcommitment (OC) scale, and the Insomnia Severity Index (ISI). Using the PROCESS macro for SPSS, we conducted a moderated regression analysis to test a multiple moderation (Model 3).

Results: We gathered responses from 281 participants – 178 physicians and 103 nurses. The interaction of ERI and OC was not significant, but a three-way interaction ($ERI*OC*occupation$)

was significant in predicting ISI score. The relationship between ERI and ISI was moderated by OC depending on a respondent's occupation. For physicians as OC increased the relationship between ERI and ISI increased as well. For nurses as OC increased the relationship between ERI and ISI decreased.

Conclusion: This study showed that stress at work has the strongest relationship with insomnia when physicians ruminate over work problems, are easily overwhelmed with time pressure and are unable to unwind in their free time. However, when nurses obtain high scores on an overcommitment measure, they will experience sleep problems regardless of the level of occupational stress.

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0154

PERCEIVED STRESS PARTIALLY MEDIATES THE ASSOCIATION BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND SLEEP QUALITY IN YOUNG ADULTS

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Introduction: Growing evidence suggests that Adverse Childhood Experiences (ACEs) are associated with poor sleep in young adulthood. It has also been proposed that ACEs may cause stress sensitization, and perceived stress has been linked with poor sleep. We hypothesized that the relation between ACE exposure and poor sleep is mediated by perceived stress.

Methods: One-hundred and twenty-five (86% Female; mean±SD, age = 22±3 y) young adults between the ages of 18 and 30 years completed the 10-item ACE questionnaire, the Perceived Stress Scale, and the Pittsburgh Sleep Quality Index to quantify ACE exposure, perceived stress (PS), and global sleep quality (GSQ), respectively. Zero-order correlations were used to examine relations among ACE exposure, PS, and GSQ. Multiple linear regression analyses were used to examine the effect of ACE exposure on PS and GSQ after adjustment for sex, age, Race, and Ethnicity. Mediation analysis was then performed using the Bootstrapped Bias-Corrected Percentile Confidence Interval method, and the variance accounted for (VAF) was calculated as the ratio of the indirect effect to total effect β -coefficients.

Results: ACEs were highly prevalent (69% with ≥ 1 ACE; 30% with ≥ 4 ACEs) and variable (range = 0 – 10 ACEs). ACE exposure was associated with greater PS ($r=0.40$; $p<0.0001$) and worse GSQ ($r=0.31$; $p<0.0001$). Higher PS was associated with worse GSQ ($r=0.31$; $p=0.0005$). After adjustment, ACE exposure remained a significant predictor of both GSQ ($\beta=0.29$; $p=0.002$) and PS ($\beta=0.39$; $p<0.0001$). PS significantly, partially mediated the association between ACE exposure and GSQ (indirect effect standardized β -estimate = 0.035 [95% CI = 0.013 – 0.069]; VAF = 29%).

Conclusion: ACE exposure is associated with greater perceived stress and poorer sleep quality among young adults. Perceived stress partially mediated the association of ACE exposure with sleep quality. Studies confirming the directionality and causality of these associations (including longitudinal mediation), and subsequently whether stress reduction interventions can promote improvements in sleep among individuals with ACEs are needed.

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0155

PERSISTENT ACTIVATION OF TXNIP AND NLRP3 INFLAMMASOMES IN CORTICAL GLIA AND NEURONS AFTER MILD TRAUMATIC BRAIN INJURY

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Introduction: Mild traumatic brain injuries (TBI) induce persistent dysregulated sleep, reactive oxygen species (ROS), and inflammation. Nucleotide-binding domain leucine rich family pyrin containing 3 (NLRP3) inflammasomes are protein complexes that stimulate caspase-1 to activate the somnogenic pro-inflammatory cytokines IL-1 β and IL-18. ROS induce thioredoxin interacting protein (TXNIP) to activate NLRP3 inflammasomes by inhibiting thioredoxin which inhibits ROS. We previously found that mice lacking NLRP3 have increased non-rapid-eye movement (NREM) sleep and slow-wave activity (SWA) 24 h after mild TBI, but at 2 months post-injury these values are reduced. Following up on this, we sought to determine the activity of NLRP3 inflammasomes in glia and neurons after mild TBI.

Methods: Two-month-old mice lacking NLRP3, and wild-type mice received a craniectomy and mild TBI via controlled cortical impact or sham. Frontal and somatosensory cortices were collected without a TBI and at 24 h and 2 months post-TBI. Microglia, astrocytes, and neurons were isolated using fluorescent-activated cell sorting, and reactive oxygen species (ROS), RNA and protein were quantified using RT-PCR and ELISAs. Significance was set at $p < 0.05$.

Results: RNA, protein, and ROS control treatment values were similar for both genotypes in cortical microglia, astrocytes, and neurons. In wild-type mice, NLRP3, IL-1 β , IL-18, caspase-1, and TXNIP expression along with ROS values were significantly greater and thioredoxin expression was significantly less in cortical microglia, astrocytes, and neurons 24 h and 2 months post-TBI. In wild-type cortical microglia, astrocytes, and neurons NLRP3, IL-1 β , and TXNIP expression levels were significantly greater in these cell types 2 months vs. 24 h post-TBI. Wild-type mice caspase-1 activity and NLRP3, IL-18, IL-1 β , and TXNIP protein levels, were significantly greater and thioredoxin protein levels were significantly less in both cortical areas 24 h and 2 months post-TBI. Mice lacking NLRP3 showed significant increased values of TXNIP but reduced thioredoxin expression and protein levels 24 and 2 months post-TBI but no significant differences in other measures.

Conclusion: Our findings suggest that TBI induces persistent oxidative stress, TXNIP, and NLRP3 inflammasome activation in cortical glia and neurons that likely contributes to sleep dysregulation.

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0156

PERSONALITY TRAITS AND CHRONICITY OF INSOMNIA AMONG SOLDIERS.

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Introduction: Within the behavioral model of insomnia, predisposing factors can increase vulnerability to developing problems sleep. One predisposing factor is personality characteristics and past research has identified associations between traits such as rumination/worry and perfectionism with insomnia. Past studies have not considered the chronicity of insomnia and its association with personality characteristics. The goal of this study was to examine the association between chronicity of insomnia and a wide range of personality traits to identify a risk profile for chronic sleep disturbance.

Methods: Data were acquired from the New Soldier Study(NSS) components of the Army Study to Assess Risk and Resilience in Service members(Army STARRS), which collected survey data from soldiers newly recruited to the military(N=38,348; 20.9 (3.5) years old; 82.8% male). The data captures information regarding soldiers sleep, personal characteristics and mental health symptoms. Participants reported on lifetime history of insomnia with a frequency of at least 3 nights/week as well as the number of years they have experienced insomnia. Items also assessed a range of personality traits. A stepwise selection model was used to identify a profile of personality traits associated with chronicity of insomnia.

Results: Lifetime history of insomnia was very high at 88.7%, with a mean(SD) duration of insomnia mean (SD)=3.0(2.4) years. The selection model identified three personality traits significantly associated with duration of insomnia: feeling empty inside, the need to rely more heavily on friends for emotional support, and being scared of things most people are (all $p < 0.05$).

Conclusion: These results demonstrate that, among new Army soldiers, those who have experienced chronic problems with insomnia endorse feeling empty inside leading to them stating either they are not scared of most things (increase in risk taking) or need to rely heavily on others for emotional support. Consistent with previous research, these data suggest that emotional instability is linked to poorer sleep quality.

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0157

PHYSIOLOGICAL RESPONSES TO ACUTE PSYCHOSOCIAL STRESS IN ADOLESCENTS WITH INSOMNIA

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Introduction: Insomnia often develops during adolescence, with girls being at greater risk than boys. Alterations in response to psychosocial stress have been linked to the etiology of the disorder, but it remains unclear whether the reactivity of the major stress systems (hypothalamic-pituitary-adrenal (HPA) axis and autonomic nervous system (ANS)) in response to stress is altered in adolescents with insomnia.

Methods: Forty-seven post-pubertal adolescents (age range: 16-20 years, 28 female) with (N=16; insomnia group) and without (N=31; control group) insomnia symptomatology underwent two randomized nights of polysomnographic (PSG) laboratory recordings. Participants underwent an experimental pre-bedtime stress anticipation protocol (stress night) and a control night during which they engaged in neutral activities before bedtime. The morning after the stress night, participants underwent the Trier Social Stress Test (TSST), a standardized protocol that requires participants to complete verbal and arithmetic tasks in front of observers. On both nights, heart rate (HR) was measured across the night and cortisol was collected upon awakening and 30 minutes later to calculate cortisol awakening responses (CAR). Stress perception, salivary cortisol (HPA activity), and HR were measured during the TSST.

Results: There were no differences in nocturnal HR recovery or in the CAR on the stress night compared with the control night in either group. Morning pre-TSST stress levels did not differ between groups. Both groups exhibited significant increases in HR in response to the TSST ($p < 0.05$). HR was higher in girls compared to boys in the control group at baseline ($p < 0.05$). Potential group differences in HPA responses to the TSST were inconclusive due to the apparent confounding effect of the CAR on cortisol responses to stress: many participants did not show a cortisol response to the task and larger CARs were associated with an attenuated cortisol response.

Conclusion: There were no significant differences in HR responses to anticipation of experimental stress during the night or in response to the morning TSST between adolescents with and without insomnia. Further work is needed to examine whether altered responses to stress may emerge if insomnia becomes chronic.

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0158

PRELIMINARY STUDY OF THE LINKS BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND ACTIGRAPHY-MEASURED SLEEP CHARACTERISTICS IN YOUNG ADULTS

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Introduction: Adverse Childhood Experiences (ACEs) are highly stressful events during the first 18 years of life that have been linked with adverse adult health outcomes. Sleep is an important behavioral risk factor for a myriad of health outcomes that have been linked to ACE exposure. A growing body of evidence indicates that ACEs are associated with low self-reported sleep durations, but these findings should be verified using objectively measured sleep characteristics. The purpose of this study was to examine associations of ACE exposure with actigraphy-measured sleep duration, timing, and variability.

Methods: In twenty-four young adults (20F/4M; mean±SD, age=24±5 y), we assessed ACE exposure using the 10-item ACE scale and measured sleep characteristics over a ≥6 day period using a wrist-worn actigraphy device. Participants with 0–1 ACEs were characterized as low-ACE (ACE-low, n=10) and participants with 2+ ACEs were characterized as moderate-high-ACE exposure (ACE-mh, n=14). Independent samples t-tests and Hedges' g effect sizes were used to compare total sleep duration, bed-time, get-up time, time-in-bed, sleep onset latency and the standard deviation of bed time and total sleep duration between groups.

Results: Time-in-bed was greater in ACE-mh than in ACE-low (mean±SE difference=60±25 min; p=0.027; g=-0.95), yet there was no difference in total sleep duration (-9±10 min; p=0.46; g=-0.37). This discrepancy was accompanied by a non-significant, but large-effect size difference between ACE-mh and ACE-low (-15±7 min; p=0.051; g=-0.83) in sleep onset latency. There were no differences between groups in either bed-time (p=0.34; g=0.39) or get-up time (p=0.35; g=-1.2), nor in either bed-time (p=0.84; g=-0.08) or total sleep duration (p=0.36; g=-0.37) variability.

Conclusion: In contrast to prior evidence based on self-report, our initial evidence indicates that ACE exposure is not linked with shorter sleep durations or higher sleep variability when measured using actigraphy. Instead, ACE exposure is linked to greater time in bed and greater sleep onset latencies, suggesting that individuals exposed to ACEs may have less efficient sleep.

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0159

SLEEP DISTURBANCE, MEDIA CONSUMPTION, AND POST TRAUMATIC STRESS FOLLOWING HURRICANE HARVEY

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Introduction: Experiencing one-time traumatic events such as a hurricane is known to produce sleep disturbances that may contribute to the development and maintenance of PTSD symptoms (Mellman, 2019). Additionally, greater exposure to media coverage during and following such events has been shown to contribute to elevated post-traumatic stress (PTS; Shin & Sommers, 2021). However, whether media consumption might moderate the relationship between sleep disturbances and PTS symptoms has not been examined. We examined these relationships in a sample of college students following Hurricane Harvey, an epic storm that hit Texas in 2017 and received non-stop media coverage for an extended period after the storm.

Methods: Participants were undergraduate students (N=260, M age=21.32) at the University of Houston during Hurricane Harvey. Students answered online surveys 6-8 months following the hurricane that measured sleep quality and PTS symptoms over the last month, and media use both during and immediately following the hurricane. Sleep was assessed using the Pittsburgh Sleep Quality Index (PSQI) and PTS symptoms were assessed using the PTSD Checklist for DSM-5 with sleep questions removed.

Results: Results indicated that active media consumption post hurricane was significantly correlated with PTS symptoms (r=.21, p<.001). Regression analyses showed sleep quality significantly predicted PTS symptoms (R² change=.133, p<.001).

However, contrary to expectation, this relationship was not moderated by active media consumption after Hurricane Harvey (R² change=.19, p=.495).

Conclusion: Previous research has found both sleep disturbance and greater exposure to media coverage of traumatic events are associated with greater symptoms of PTS. Although media exposure to trauma may impact sleep quality, our findings suggest these factors to exert independent effects on PTS symptoms. Better understanding of the role of media consumption in the aftermath of trauma is needed to understand these relationships.

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0160

SLEEP QUALITY AFFECTS THE HEART RATE SIGNAL WHEN FACING THE DIFFERENT STRESS SOURCES

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Introduction: Stressful conditions can impact our judgement and increase the risk of adverse events such as workplace accidents, falls, and automobile collisions, among others. Sleep quality has also been shown to influence stress responses and heart rate variability (HRV) has proved to be a useful indicator of stress in a variety of scenarios. Therefore, wearable devices such as heart rate monitors may be able to reduce adverse events by measuring stress responses. Among subjects reporting different sleep quality, we measured heart rate variability (HRV) before and after different stressors to understand whether these stressful events could be detected by a wearable device.

Methods: Twenty-four subjects (male = 10; female = 14) with no known health conditions participated in this study. Subjects were divided into good sleep quality (N = 12) and bad sleep quality (N = 12) groups based on their Pittsburgh Sleep Quality Index (PSQI) score. Each subject engaged in a physical stress and mental stress on separate days and HRV was assessed before and after each stress intervention. T-tests were used to assess the change in HRV from pre- to post stress condition for each group.

Results: In the good sleep quality group we found several statistically significant differences across several HRV frequency-domains before and after physical stress (Low frequency: p = 0.0292; High frequency: p = 0.0287; Low frequency/ High frequency ratio: p = 0.0245) and mental stress (Low frequency: p = 0.0394; High frequency: p = 0.0387; Low frequency/ High frequency ratio: p = 0.0373).

Conclusion: Our findings indicate that sleep quality may influence the HRV response to different stressors. This suggests that HRV measured via wearable device may be used to provide warning under stressful conditions that could help prevent accidents and other adverse events.

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0161

STRUCTURAL CHANGES IN MOOD DOMAINS DURING SLEEP DEPRIVATION AND RECOVERY

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Introduction: Mood is known to vary as a function of sleep debt. Mood batteries often measure multiple, non-orthogonal domains. In the present study, the latent structure of the Automated Neuropsychological Assessment Metrics Mood (ANAM-mood) battery was assessed during five different states of alertness. We present a novel scheme to evaluate changes in the structure of such batteries across conditions. It was hypothesized that the structure would change, with the greatest changes manifest during sleep deprivation.

Methods: The present analyses were conducted on data from a prior sleep deprivation study ($n = 25$ healthy young adults). We used the identity property of MANOVA. Given correlation matrices Σ_i and Σ_j , structural invariance was defined as $\Sigma_i \Sigma_j^{-1} \approx I$ (Identity). MANOVA statistic m was the largest eigenvalue of $\Sigma_i \Sigma_j^{-1}$. Resampling was used to generate m -distributions within and between the five different alertness conditions - Rested, Sleep Deprived (SD) days 1 and 2, and Recovery days 1 and 2. In addition, the relative number of mood dimensions was estimated by the odds (via resampling) of two dimensions explaining 80% of the variance of Σ_i compared to Σ_j .

Results: The pairwise MANOVA-statistic revealed significant structural variations across conditions ($p < 0.001$ for all comparisons). Significant differences included Rested vs SD1 and SD2. Recovery 1 showed the most pronounced differences to all conditions. Recovery 2 was like Recovery 1, but more like Rested than the prior day. The odds ratio of two-dimensions for Recovery 1 was much higher compared to all other conditions (OR: 2.4-245, $p < 0.001$).

Conclusion: Individuals respond differently to a mood survey across specific alertness conditions resulting in structural changes to the data. Wakefulness during recovery from severe sleep loss differs most significantly from all states, contrary to our hypothesis. This is important to consider when interpreting mood changes as measured by such batteries (including related Spielberger's State Anxiety Inventory and Beck Depression Inventory-II) during sleep studies. Follow up studies are needed to fully assess such effects and devise methods to account for them.

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0162

THE NEURAL BASES OF EMOTION DYSREGULATION IN ROTATING SHIFT WORKERS

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Introduction: Shift work is known to be associated with sleep disturbance and circadian misalignment and may contribute to alterations in the brain implicated in emotion dysregulation. In this study, we examined 1) neural correlates of emotion dysregulation, including emotional reactivity and regulation in shift workers and 2) relationships between neural correlates of emotion dysregulation, sleep disturbance, and circadian misalignment.

Methods: Fifty-six rotating shift workers (SW, 42 females, 30.80 ± 6.94 years old) who had non-standard shift schedules and 52 healthy controls (HC, 36 females, 31.69 ± 7.86 years old) who did not work as shift schedules participated in this study. Both SW and HC completed self-reported measures of sleep and mood problems, and wore sleep diary and wore actigraphy to assess sleep quality and circadian rhythms. They also underwent one night polysomnography and were scanned while they were performing the emotion regulation task. We analyzed group differences in mood, sleep, circadian rhythms, and neural bases of emotional reactivity and regulation, and examined relationships between these variables.

Results: SW showed significant differences in actigraphy-estimated sleep (i.e., lower sleep efficiency) and circadian rhythms (e.g., greater motor activity [M10] and lower interdaily stability) compared to HC. SW also exhibited increased anterior insula (AI) activation in response to negative pictures, but reduced activation in the dorsomedial prefrontal cortex (dMPFC) and AI-dMPFC functional connectivity during emotion regulation compared to HC. AI activation and AI-dMPFC functional connectivity were significantly associated with sleep disturbance (i.e., sleep diary-estimated sleep onset latency) and circadian misalignment (e.g., M10 and interdaily stability). Furthermore, a mediation analysis revealed that shift work was associated with increased motor activity during the most active 10-hour period, which then contributed to increased AI activation in response to negative pictures.

Conclusion: Our findings suggest that shift work may contribute to sleep disturbance and circadian misalignment, and neural alterations associated with emotional reactivity and regulation. Furthermore, the mediation result suggests that increased motor activity along with misaligned circadian rhythm may serve as a pathway, through shift work contributes to heightened emotional reactivity to negative information.

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0163

IMPACT OF COLD-WATER HAND IMMERSION ON COGNITIVE PERFORMANCE AND SLEEPINESS DURING SLEEP INERTIA

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Introduction: Sleep inertia is a state of impaired cognitive performance upon awakening that dissipates with time awake. Manipulation of the distal-to-proximal skin temperature gradient using cold water has been hypothesized as a potential countermeasure to sleep inertia, but not previously explored (Krauchi et al., 2004). This study examined the effects of cold-water hand immersion on subsequent cognitive performance and sleepiness during sleep inertia.

Methods: Ten healthy adults (mean±standard deviation [SD] age 23.2±4.96 years; 6M, 4F) have thus far completed an ongoing 8-day protocol. Prior to an overnight in-laboratory visit, participants maintained habitual 8h sleep schedules for 1 week at home. In-laboratory sleep opportunities were timed to coincide with habitual sleep time. Following at least 5-min of electroencephalogram (EEG) verified continuous slow wave sleep (SWS), participants were awakened twice during the night to submerge their non-dominant hand in warm (34 C) or ice-cold water (0 C) for 3 min in a randomized, crossover design. Sleep inertia was assessed with a Mathematical Addition Test (ADD) and the Karolinska Sleepiness Scale (KSS) at ~ 5, 15, and 25 min after each awakening. Outcomes included number of correct responses and median reaction time for correct responses on the ADD and KSS scores. Data were analyzed with mixed-model ANOVA with condition, condition order and time since awakening as fixed factors and subject as a random factor.

Results: The average (Mean±SD) amount of SWS prior awakening was similar before the cold 7.0±2.3 min and warm 6.6±1.0min conditions ($p>0.10$). Following cold water immersion, subjective sleepiness was reduced and the median reaction time for correct responses was faster compared with warm water immersion (main effects of condition, $p's<0.05$). The number of correct responses was not significantly different between conditions, nor were there any significant interaction effects among the fixed factors.

Conclusion: These preliminary findings indicate that cold-water hand immersion may reduce sleepiness and increase the speed of arithmetic calculations during sleep inertia, which could have important implications for military and first responders performing after awakenings from sleep.

Support (if any): Office of Naval Research MURI N00014-15-1-2809; NIH RHL165343A and CTSA Grant UL1 TR002535; Undergraduate Research Opportunities Grant, University of Colorado Boulder.

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0164

MOVE YOUR FEET AND SLEEP: A LONGITUDINAL DYNAMIC ANALYSIS OF PHYSICAL ACTIVITY, SEDENTARY BEHAVIOR, AND INSOMNIA SYMPTOMS

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Introduction: Insomnia symptoms, which include sleep disturbances and daytime dysfunction, are associated with poor physical and mental health. Physical activity has been associated with good sleep while sedentary behavior has been associated with poor sleep. This study investigated whether physical activity and sedentary behavior are associated with insomnia symptoms both generally (i.e., between-persons, mean-level) and dynamically (i.e., within-persons, person-centered).

Methods: Participants (N=775) included adults (Mage=47.3 years, 54.6% female) who completed an online longitudinal study investigating sleep and health across the lifespan at three time points (approximately 17-weeks apart). Participants reported: (a) their duration of moderate-to-vigorous physical activity per week (in minutes), (b) the percentage of their day spent sedentary, and (c) their insomnia symptoms via the Insomnia Severity Index which was scored according to traditional standards (i.e., total score) as well as proposed two factor scores: (1) Sleep Disturbance (items 1,2,3) and (2) Daytime Dysfunction (items 4,5,6,7). Multilevel modeling was used to examine the associations among physical activity, sedentary behavior, and insomnia symptoms at both between- and within-persons levels.

Results: No significant associations were observed among total ISI score or the factor scores, and minutes spent in moderate-to-vigorous physical activity (all $p's>.05$). Sedentary behavior, however, was significantly associated with total ISI score at both the between-person and within-person levels ($\beta=.02$, $t=2.71$, $p=.007$; $\beta=0.03$, $t=2.62$, $p=.009$, respectively). For the Sleep Disturbance factor, between-person sedentary behavior was not a significant predictor while within-person sedentary behavior was associated with higher sleep disturbance scores ($\beta=0.01$, $t=1.16$, $p=.245$; $\beta=.01$, $t=2.06$, $p=.039$, respectively). For the Daytime Dysfunction factor, both between-persons and within-person levels of sedentary behavior were associated with increased daytime dysfunction ($\beta=.02$, $t=3.30$, $p=.001$; $\beta=.01$, $t=2.53$, $p=.012$).

Conclusion: Sedentary behavior appears to be a more robust predictor of insomnia symptoms than physical activity. Further, the association between sedentary behavior and insomnia symptoms was observed to be dynamic in that when an individual reported being more sedentary than customary, they also reported more insomnia symptoms. Future analyses should consider demographic variables and comorbid conditions to identify subgroups in which these associations are most pronounced.

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0165

THE RELATIONSHIPS BETWEEN EARLY MATERNAL SLEEP AND MOTHER-INFANT BONDING, AND INFANT BEDTIME DIFFICULTY LATER: A PATH ANALYSIS

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Introduction: Infant sleep is influenced by biopsychosocial factors. However, the influences of early parental sleep quality and parent-infant bonding on infant sleep development are underexplored. This study aimed to examine the relationships between

early maternal sleep quality and mother-infant bonding at 8 weeks postpartum, and infant bedtime difficulty at 3 months postpartum.

Methods: This study is a secondary analysis from the Snuggle Bug/Acurrucadito Study, an observational, longitudinal cohort study investigating the associations between 24-hr sleep-wake patterns, gut microbiome, and weight development among infants. Mothers ($n=60$, 31.5 ± 5.4 y, 66.3% married, 40.8% Hispanic, 41.5% < bachelor's degree) and their full-term (≥ 37 wk), singleton infants without major complications were recruited from Phoenix, Arizona metropolitan area. At 3 and 8 weeks, and 3 months of infant age, mothers completed the Pittsburgh Sleep Quality Index (PSQI, range: 0-21, higher scores indicate worse sleep quality), and reported on infant bedtime difficulty, using a 5-point Likert scale (range: 1-5) with higher scores indicating greater bedtime difficulty. Mother-infant bonding was measured by the Postpartum Bonding Questionnaire (PBQ, range: 0-125) at 8-week age, with higher scores indicating greater bonding problems. Based on the Transactional Model of Infant Sleep, path analyses were conducted to identify the direct effect of 8-week PSQI scores, and indirect effects of 8-week PBQ total scores and 8-week bedtime difficulty on 3-month bedtime difficulty, using z scores for all variables and the 3-week bedtime difficulty as a covariate.

Results: At 8 weeks postpartum, the means of PSQI, PBQ, and bedtime difficulty were 5.8 ± 2.6 , 5.3 ± 4.7 , and 2.4 ± 1.0 , respectively. Bedtime difficulty at 3 months was 2.0 ± 1.0 . After adjusting for the 3-week bedtime difficulty, the 8-week maternal sleep quality was not directly associated with 8-week ($\beta = .005$, 95%CI [-0.31, 0.32]) or 3-month infant bedtime difficulty ($\beta = -0.14$, 95%CI [-0.43, 0.14]), whereas 8-week mother-infant bonding significantly mediated the relationship between 8-week maternal sleep quality and 3-month infant bedtime difficulty ($\beta = 0.1$, 95%CI [0.02, 0.22]).

Conclusion: This study highlighted that early maternal sleep may disrupt early mother-infant bonding, which, in turn, may increase infant bedtime difficulty later in development. Future research should investigate how best to support healthy family sleep and bonding relationships.

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0166

EFFECTS OF EVENING PRE-SLEEP ALCOHOL ON NEXT-DAY PSYCHOMOTOR VIGILANCE (PVT) PERFORMANCE

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Introduction: Few reports have examined how pre-sleep alcohol affects performance on the next day given adequate sleep opportunity on a preferred schedule. Our goal is to identify whether alcohol intake targeting .08g% 1 hr before sleep of ~8 h will affect PVT performance on subsequent days, with the hypothesis that morning performance will be negatively affected.

Methods: 25 adults (13F; age range 22-57 y) completed the full study, including at-home sleep on a fixed schedule of 8-9 hr and two 3-night in-lab PSG sessions spaced ≥ 3 days apart. Sessions were counterbalanced for alcoholic or nonalcoholic control beverage administered in 3 drinks over 45 minutes ending 1 hr before bedtime. Alcohol was targeted to .08g%. The 10-min PVT (Ambulatory Monitoring, Inc.) was given each night (PM-Lab) 1.5 hr before drinking and in the morning after a light breakfast (AM-Lab) 50 min after waking. PVT was performed at home/work twice each day within 1.5-h windows starting 3h after waking (AM-Home) and 7.5h after waking (PM-Home). Two reaction time (RT) variables were assessed: RRT (1/RT), FRT (10% fastest RT). Linear mixed effects models were used to account for nesting of assessments within alcohol/control condition and days.

Results: RRTs showed slowed RT (meanRT $\pm$ SE) following alcohol: AM-Lab $F=7.234$, $p=.008$, alcohol RT= 246 ± 9.6 msec, control RT= 234 ± 9.6 msec; AM-Home $F=17.936$, $p<.001$, alcohol RT= 254 ± 9.5 msec, control RT= 242 ± 9.6 msec; but not PM-Home or PM-Lab tests. FRT slowed for AM-Lab $F=9.391$, $p=.003$, alcohol FRT= 195 ± 4.3 msec, control FRT= 201 ± 4.3 msec; AM-Home $F=17.251$, $p=.001$, alcohol FRT= 202 ± 4.4 msec, control FRT= 194 ± 4.4 msec; PM-Home $F=3.379$, $p=.068$ (trend), alcohol FR= 200 ± 4.8 msec, control FRT= 196 ± 4.8 msec, but not for PM-Lab PVTs. PM-Home FRT also had a significant day order effect: $F=3.087$, $p=.0496$, Day 1 FRT= 197 ± 5.0 msec, Day 2 FRT= 202 ± 5.0 msec, Day 3 FRT= 195 ± 5.0 msec.

Conclusion: We found statistically significant slowing of psychomotor vigilance RT on days after pre-sleep alcohol lasting up to 3-4.5h after waking in the morning (with a trend up to 7.5-9h post waking). PVT lapses (not shown) were similarly affected by alcohol. Thus, even with sufficient sleep opportunity, RT is impaired following 3 consecutive nights of alcohol drinking.

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0167

INFLUENCE OF LIGHT EXPOSURE, EXERCISE, CAFFEINE INTAKE, AND NICOTINE USE ON SLEEP OF U.S. NAVY SAILORS DURING HOME PORT OPERATIONS

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Introduction: Insufficient sleep is pervasive in U.S. Navy (USN) sailors and has been associated with increased risk of injury and mood disturbances. As such, monitoring sleep and identifying modifiable targets that influence sleep in this population is essential. We examined the sleep of USN sailors during 9-months in port and explored the influence of different lifestyle behaviors on sleep.

Methods: Sailors ($n = 101$, 31 ± 7 years old [mean $\pm$ SD], 21% female) wore a commercial wearable sleep-tracking device (Oura Ring, Gen2) during a 9-month home port maintenance period (September 2021 – May 2022). During the study, the sailors slept at home and had periods working on the ship (on-hull; higher demands) and off the ship (off-hull; lower demands). Participants also completed 5 self-report surveys that assessed sleep quality (Pittsburgh Sleep Quality Index; PSQI) and multiple lifestyle behaviors including: hours of natural light exposure, hours of moderate/vigorous physical activity, and intake of caffeine, nicotine, and alcohol. Sleep outcome measures from the

wearable device included total sleep time (TST), standard deviation of TST (SD TST), and sleep efficiency (SE). Linear mixed models were used to examine the effects of lifestyle behaviors on sleep. Timepoint and on/off-hull condition were also included as fixed effects, while participant was included as a random effect.

Results: Participants slept 6.5 ± 0.7 hours a night (6.2 ± 0.9 on-hull; 6.4 ± 0.8 off-hull; $p > .05$) and had slightly elevated PSQI scores that were higher on-hull (8.3 ± 4.6) than off-hull (6.5 ± 3.5 ; $B = 1.83$, Std. Error = 0.71 , $p = .01$). Lifestyle behaviors were not significant predictors of PSQI, TST, SD TST, or SE ($p > .05$).

Conclusion: Lifestyle behaviors had weak relationships with self-reported and objective sleep outcomes in this exploratory analysis. Therefore, modifying lifestyle behaviors may not significantly influence sleep in USN sailors during home port periods. Still, additional behavioral targets (e.g., diet), specific aspects of behavioral outcomes (e.g., light exposure timing, exercise intensity), and other work-related factors (e.g., workload, schedule) that can affect sleep should be explored in future efforts.

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0168

THE ROLE OF ALERTNESS (VS. FATIGUE) IN THE PERFORMANCE OF PROFESSIONAL CRIMINAL INVESTIGATORS

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Introduction: Investigative interviews and interrogations are a critical component of official inquiries. However, how levels of alertness (vs. fatigue) of the interviewer impact performance during investigative interviews or their outcomes is unclear. To this end, the current effort aimed to estimate the impact of objectively estimated alertness on (1) deception detection across true and false alibi statements and (2) outcomes of real-life investigative interviews conducted by officers in the field.

Methods: To achieve the first goal, sets of 8 video-recorded alibi statements (each from a different individual, with half being true) were presented to 26 law-enforcement professionals (average age of 42, two-thirds male). Prior to judging the alibi statements on truthfulness, they completed the 5-min Psychomotor Vigilance Test and rated their sleepiness. To achieve the second goal, another study tracked daily fluctuations in alertness among investigators to predict their experiences with actual field interviews. Fifty law-enforcement investigators (mean age 42, 75% male) wore a sleep-activity tracker (Readiband) for two weeks while keeping a daily-diary of interviews conducted in the field. For each interview, the investigators indicated (a) how well they established rapport with the subject, (b) how much resistance they encountered, (c) how well they maintained their own focus and composure, and (d) the overall utility of evidence obtained. Readiband-generated estimates of daily fatigue were used to predict daily interview outcomes.

Results: First, when judging alibis' credibility, officer's alertness was a strong predictor of lie-detection performance. Specifically, officers who were better at detecting deception across alibi statements were more objectively alert, indicated by faster reaction times ($r = .52$) and fewer attentional lapses ($r = -.67$). This better detection performance was largely accounted by stronger skepticism of actual lies. Second, Investigators from the field-interviewing study consistently reported more difficulties maintaining their focus and composure

during interviews on days with lower alertness, as well as indicated more subject resistance and less rapport.

Conclusion: The findings suggest fatigue among criminal investigators (and underlying sleep disruption) is an important factor for how actual law-enforcement field interviews unfold. The findings implicate adequate sleep as a modifiable fitness factor for criminal investigators.

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0169

VARIABILITY IN SLEEP AND EATING ARE ASSOCIATED WITH SUBCLINICAL ATHEROSCLEROSIS IN EARLY ADULTHOOD

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Introduction: Experimental studies show that sleeping and eating at times that do not align with one's endogenous biological timing ('circadian misalignment') promotes a physiological environment that favors cardiovascular disease (CVD) development. Day-to-day variability in sleep and eating are considered common causes of circadian misalignment in the general population. While emerging evidence suggests that variability in sleep and eating behaviors predicts overt CVD in middle-aged and older adults, the extent to which these behaviors relate to biomarkers of CVD development in subclinical stages has not been fully elucidated.

Methods: Adults without chronic health conditions or sleep disorders completed 14 days of concurrent sleep and dietary assessments via continuous wrist actigraphy and time-stamped photo-assisted diet records, respectively. Variability in sleep duration, sleep midpoint, eating onset/offset (clock time of first and last caloric consumption, respectively), and caloric midpoint (clock time at which 50% of total daily calories are consumed) were quantified for each variable, operationalized as the standard deviation (SD) across the monitoring period. Multivariable regression models determined the cross-sectional association between metrics of sleep and eating variability with carotid intima-media thickness (CIMT), an established biomarker of subclinical atherosclerosis, measured at end-diastole via B-mode ultrasonography. Models adjusted for age, sex, resting systolic blood pressure, sleep duration, and total daily caloric intake.

Results: Participants ($N=61$) were 29.1 ± 7.1 years, 66% female, with a blood pressure of $113 \pm 9/70 \pm 7$ mmHg. Variability in sleep midpoint ($p=0.19$), eating onset ($p=0.19$), and eating offset ($p=0.40$) were not associated with CIMT. Alternatively, each 60-minute increase in sleep duration SD was associated with a 0.05 ± 0.02 mm greater CIMT ($p=0.005$), while each 60-minute increase in caloric midpoint SD was associated with a 0.04 ± 0.01 mm greater CIMT ($p=0.009$). Sleep duration SD ($p=0.02$) and caloric midpoint SD ($p=0.04$) remained associated with CIMT in an exploratory adjusted model that included both variables.

Conclusion: Metrics of sleep and eating variability are associated with subclinical atherosclerosis in free-living adults. These data support a growing body of literature indicating that encouraging regularity in nightly sleep duration and the timing of daily caloric consumption may represent behavioral strategies to mitigate risk for overt CVD.

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0170

WHEN TO SLEEP AND WORK TO OPTIMIZE ALERTNESS

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Introduction: Currently, millions of individuals work outside of the conventional 9-to-5 work shift and are often required to sleep at times that are not conducive to maximizing restorative sleep. This insufficient sleep leads to health and cognitive performance impairments that compromise workers' safety and productivity. This can be mitigated by sleeping at the time of day that maximizes the restorative benefits of sleep and working at favorable hours, within their particular opportunity windows. Here, we present an optimization algorithm to identify sleep and work schedules that maximize alertness during work hours, while reducing impairment during non-working hours to the greatest extent possible.

Methods: We developed an optimization algorithm that searches through a large number of possible sleep and work schedules to identify the one that maximizes alertness during work times, while meeting user-provided constraints, such as the periods during which the user has flexible opportunities to sleep and work. To generate the possible sleep and work schedules, we used the well-validated Unified Model of Performance (UMP), including its ability to predict sleep latency and sleep duration. To assess the algorithm, we simulated four experimental studies, where we compared the effectiveness of the sleep schedules obtained by the algorithm against those of the sleep schedules used in the studies. In addition, we tested the algorithm's ability to simultaneously optimize sleep and work schedules in one of the studies.

Results: Using the same amount of sleep as in the studies, the algorithm proposed sleep schedules that optimally allocated sleep, reducing alertness impairment during work hours by an average of 29%. Similarly, by simultaneously optimizing sleep and work schedules during a recovery period following a chronic sleep-restriction challenge, the algorithm's solutions resulted in recovery to baseline alertness levels two days earlier than the conventional 9-to-5 work schedule.

Conclusion: Our work provides the first quantitative tool to optimize sleep and work schedules and complements other existing fatigue-management tools to provide a more comprehensive set of countermeasure strategies to mitigate alertness impairment due to limited sleep.

Support (if any):

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0171

ASSESSMENT OF STUDENT SLEEP AND WELL-BEING DURING A STRESS INOCULATION TRAINING AT THE U.S. NAVY SURFACE WARFARE OFFICERS SCHOOL

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Introduction: Military operations frequently take place in complex, volatile, and ambiguous environments, where important information may be uncertain. These circumstances are often highly stressful, and fatiguing due to sustained operations, shift work, sleep loss, and the taxing nature of the work. As a crucial part of their preparation for leading U.S. Navy sailors, prospective executive officers (PXOs) in the Surface Warfare community receive training at the Surface Warfare Schools Command (SWSC). At the request of SWSC, the NPS research team was asked to assess the stress loads of SWO students during their expanded 10-week training course, which included the implementation of a stress inoculation training (SIT) program.

Methods: SWOs (N=50) attending the Prospective Executive Officer (PXO) Course at SWSC participated in a quasi-experimental longitudinal study. They completed questionnaires three times during the PXO course: at the beginning of the study, at the mid-point, and at the end of the course. Standardized tools were used to assess perceived stress levels (Perceived Stress Scale – PSS), depression symptoms (Patient Health Questionnaire – PHQ-8), anxiety (General Anxiety Disorder questionnaire – GAD-7), and mood (Profile of Mood States – POMS). Sleep attributes were assessed by wearable devices (ÖURA rings).

Results: Overall, the scores of SWOs on the PSS, PHQ-8, GAD-7, and POMS were lower or equivalent to scores reported for the general population. However, reported levels of perceived stress increased significantly from the beginning to the end of the PXO course (average PSS=9 vs 12). However, PHQ-8, GAD-7, and POMS scores remained stable across the three time points. On average, PXOs received 6.6 ± 0.65 hours of sleep per night on weeknights at SWSC, with about one additional hour of sleep on weekends.

Conclusion: These findings indicate that, while SWOs experienced an increase in perceived stress during the PXO course, their overall well-being is not substantively different from the general population. Participants appear to use weekends for additional restorative sleep, obtaining adequate amounts of sleep on weekends. We did not observe evidence of impairments in mental or physical wellness of SWOs attending the PXO course at SWSC.

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0172

CANADIAN VARSITY ATHLETES' SLEEP AND MENTAL HEALTH: PRELIMINARY ANALYSES

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Introduction: Because of their double reality of university student and athlete, varsity athletes are particularly at risk of having sleep difficulties, but also depression and anxiety symptoms. To this day, there is almost no data available characterizing the sleep of Canadian varsity student-athletes, while these athletes must often combine their studies and sports practice with a job to support themselves. As part of a larger study, the aim of the present study was to investigate the relationship between sleep and well-being in young Canadian varsity athletes at the beginning of their sports season.

Methods: A team of 16 Canadian varsity basketball players that will undergo a sleep management program completed a modified version of the Pittsburgh Sleep Index Quality (PSQI), the insomnia severity index (ISI), the Epworth Sleepiness Scale (ESS), the Generalized Anxiety Disorder-7 (GAD-7), the Patient Health Questionnaire-9 (PHQ-9), and the Athlete Burnout Questionnaire (ABQ) before the intervention at the start of the season. The relationships between scores on each well-being questionnaire and scores on the sleep questionnaires were investigated using Pearson product moment correlations.

Results: Total GAD-7 scores were significantly associated with PSQI scores ($r=.666$, $p=.005$) and ISI scores ($r=.755$, $p<.001$). Total PHQ-9 scores were significantly associated with PSQI scores ($r=.844$, $p<.001$) and ISI scores ($r=.855$, $p<.001$). Total ABQ scores were significantly associated with PSQI scores ($r=.592$, $p=.016$). There was no other significant correlation found.

Conclusion: These preliminary results suggest that sleep disturbances, such as insomnia symptoms and poor sleep quality are closely associated with anxiety, depression, and athlete burnout symptoms in varsity athletes. Future analyses of this study will allow us to verify whether participation in a program aimed at improving sleep can have an impact on their mental health, as well as on other aspects related to the practice of their sport.

Support (if any):

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0173

IMPROVING WELL-BEING BY CHANGING THE SHIFTWORK SCHEDULES AT U.S. NAVY WATCHFLOORS

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Introduction: Watchfloors provide around-the-clock information, intelligence, and technical support to the U.S. military. Active-duty service members (ADSMs) working on these 24/7 watchfloors stand watches to include night shifts and/or frequent shift rotations. Tailoring shiftwork schedules to optimize individual sleep patterns may reduce the negative effects of shiftwork. The purpose of this study was to test whether a new shiftwork schedule would improve ADSM well-being and sleep.

Methods: ADSMs ($N=79$; 83.5% males, 91.2% enlisted, 19 to 54 years of age) participated in a two-phase quasi-experimental longitudinal study to assess well-being and sleep before and after the implementation of a new shiftwork schedule. Both schedules involved three rotating shifts: day shift (0730-1530), evening shift (1320-2330), and night shift (2330-0730). The old schedule had 5 successive days on-shift (5-on/4-off) and the new schedule had 4 successive days on-shift (4-on/4-off). Shifts rotated after every off period. Standardized questionnaires were administered while participants were on the old schedule (study start) and ~5 months after switching to the new schedule. The questionnaires included the Pittsburgh Sleep Quality Index (PSQI), the Insomnia Severity Index (ISI), the Epworth Sleepiness Scale (ESS), and the Profile of Mood States (POMS). Sleep was monitored using wearable devices (OURA rings).

Results: POMS total mood disturbance scores were lower (i.e., better) on the new schedule ($p<0.001$), as were several POMS subscale scores including tension ($p<0.001$), depression ($p<0.001$),

anger ($p=0.014$), confusion ($p<0.001$), and vigor ($p=0.029$). There was a statistical trend for a decrease in ISI scores from the old schedule to the new schedule ($p=0.067$). Sleep duration, PSQI, and ESS scores did not differ between schedules (all $p>0.05$).

Conclusion: Implementation of a new shiftwork schedule that was tailored to worker sleep patterns was associated with decreased mood disturbance, improvement in negative mood states (e.g., depression and tension), and reduced insomnia symptom severity. Also, the research team received several anecdotal reports of high levels of worker satisfaction with the new schedule. This study demonstrates the positive real-world effects of using basic sleep and circadian methods to tailor shiftwork schedules to improve the well-being of military personnel.

Support (if any):

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0174

PATTERNS OF SLEEP HABITS AND THEIR IMPACT ON NIGHTTIME SLEEP QUALITY IN COLLEGE STUDENTS

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Introduction: Poor sleep quality is common in college student. Unhealthy sleep habits (e.g., delayed bedtime, inconsistent sleep routine between schooldays and weekends) could lead to poor sleep quality, which is associated with poor academic performance, mental and physical health. However, little is known about the patterns of sleep habits in terms of timing and consistency and their impact on nighttime sleep quality in college students.

Methods: This was a cross-sectional anonymous web-based survey to examine sleep in college students. The Classification and Regression Tree (C&RT) was used to identify distinct patterns based on sleep habits including bedtime and wake-up time (usual, schooldays, and weekends), and consistency of bedtime, wake-up time, and duration between schooldays and weekends. The response variable was nighttime sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI) global score. The imputed PSQI global score was used to minimize missing data.

Results: A total of 439 students participated in this survey, with a response rate at 22%. Four distinct clusters were identified. Both Cluster 1 (37.8%) and Cluster 2 (10.9%) included participants who reported a difference in sleep duration between schooldays and weekends < 1.75 hours, with Cluster 1 reporting a usual bedtime before 1:45AM while Cluster 2 after 1:45AM. Both Cluster 3 (3.4%) and Cluster 4 (47.8%) included participants who reported a difference in sleep duration between schooldays and weekends ≥ 1.75 hours, with Cluster 3 reporting school-day wake-up time before 7AM while Cluster 4 after 7AM. Among the four clusters, participants in Cluster 3 (late riser with inconsistent schooldays-weekends duration) had the worst sleep quality (8.95 ± 3.43), followed by Cluster 2 (late sleeper with consistent schooldays-weekends duration, 6.98 ± 2.79) and Cluster 4 (late riser with inconsistent schooldays-weekends duration, 6.83 ± 2.87). Cluster 1 ("early" sleepers with consistent schooldays-weekends duration) had the best sleep quality among all (5.61 ± 2.54).

Conclusion: Distinct patterns of sleep timing and consistency can have significant impact on sleep quality, with some habits such as extremely late bedtime and inconsistent sleep duration

between schooldays and weekends had the most negative impact. Tailoring interventions targeting these unhealthy sleep habits are needed in promoting sleep in this population.
Support (if any): None

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0175

POOR ASSOCIATION BETWEEN SUBJECTIVE AND OBJECTIVE SLEEPINESS IN PATIENTS EVALUATED IN A CLINICAL SLEEP CENTER

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Introduction: Sleepiness is a primary symptom among patients presenting at sleep clinics. Sleepiness is typically subjectively evaluated using the Epworth Sleepiness Scale (ESS), which has been associated with worse cardiovascular outcomes among sleep apnea patients. On the other hand, functional deficits due to sleepiness can be objectively quantified using a Psychomotor Vigilance Test (PVT). To better understand the presentation of “sleepiness”, we examined the relationship between subjective ESS and objective PVT among a clinical sample. We hypothesized that these two different measures of sleepiness would be correlated.

Methods: A prospective sample of patients being evaluated for sleep disorders in the Sleep Center at the University of Pennsylvania completed the ESS and PVT at the same clinical visit. Demographic data were obtained at the visit or derived from the electronic health record. Pearson’s linear correlations were utilized to examine the association between the ESS and both the transformed lapses (sum of square root of number of lapses and square root of lapses+1) and mean reciprocal response time (RRT) on the PVT.

Results: In total, 167 patients (98 [58.7%] males) were studied, with a mean ($\pm$ SD) age of 54.7 $\pm$ 16.8 years and BMI of 34.5 $\pm$ 9.9 kg/m². There were a similar number of White (67 [42.1%]) and Black (71 [44.7%]) participants and 129 (77.3%) had diagnosed or suspected obstructive sleep apnea (OSA). Patients had an average ESS of 8.1 $\pm$ 5.4, and 10.5 $\pm$ 10.6 lapses, 5.9 $\pm$ 2.9 transformed lapses, and mean RRT of 3.4 $\pm$ 0.7 seconds-1 on PVT. Among all patients, there was no statistically significant correlation between ESS and either transformed lapses (ρ = 0.10, p =0.200) or mean RRT (ρ = -0.10, p =0.201). Results were similar when comparing the two sleepiness measures restricted to patients with OSA.

Conclusion: Within patients being evaluated in a clinical sleep center, there was only a weak association between subjective sleepiness on the ESS and objective sleepiness on PVT. Thus, not all patients reporting daytime sleepiness have objective deficits, and vice versa. Results support using both assessments to fully characterize a patient’s sleepiness. Future studies should evaluate the relationship between adverse outcomes and subjective and objective sleepiness, alone and in combination.

Support (if any):

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0176

PREDICTORS OF SLEEP DURATION AMONG UNIVERSITY STUDENTS IN JAPAN: CROSS-CULTURAL INSIGHTS FOR DEVELOPING SLEEP HEALTH INTERVENTIONS

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Introduction: Inadequate sleep among university students, especially in Japan, contributes to low academic performance and mental health challenges. Sleep health, including adequate sleep duration and quality, may serve a protective role in promoting performance and full participation in daily life. We sought to identify factors explaining sleep duration in Japanese college students as potential targets for culturally sensitive sleep health promoting intervention.

Methods: Cross-sectional descriptive study of university students in Japan in 2021; N = 362 completed validated Japanese versions of the Pittsburgh Sleep Quality Index (PSQI), Morningness and Eveningness Questionnaire, Sleep Hygiene Practice Scale, and Dysfunctional Beliefs and Attitudes about Sleep. Indicators of sleep and PSQI subscales (except sleep duration), personality, depression, anxiety, time use, and participation quality were included in multivariate logistic regression modeling to explain less healthy (6 hours or less) versus healthier (more than 6 hours) sleep duration.

Results: Students were 20.0 (SD = 1.3) years, 86.4% female with a mean sleep duration of 400 (SD = 67) minutes. The mean PSQI score was 4.8 (SD = 2.5) indicating good sleep quality, though 41.4% of the sample reported sleeping 6 hours or less and these persons had lower sleep quality (PSQI; d = 1.20) compared to longer sleepers. Logistic regression explained category assignment (Chi-square = 68.978, df = 8, p < .001; Nagelkerke R-squared = .234). Longer sleepers were more likely to report greater sleep efficiency, less frequent sleep disturbances, lesser daytime dysfunction, shorter commuting times, a morning-like chronotype, greater participation quality, and a less agreeable personality type. Interestingly, longer sleepers reported less effective sleep hygiene practices.

Conclusion: Short sleep was common and associated with poor sleep quality. Longer sleepers were more likely to report optimal sleep health indicators and greater participation quality (i.e. engagement in meaningful activities). Counter-intuitive sleep hygiene findings indicate potential cultural variation in sleep timing, pre-sleep arousal, and environment regulation as targets for intervention. Sleep health promotion intervention should consider personality, chronotype preference and time use (e.g. meaningful activities, commuting) as factors promoting or inhibiting sufficient sleep duration and quality in university students.

Support (if any): Fulbright U.S. Scholar Award to Japan

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0177**QUANTIFYING THE DURATION AND TIMING OF PILOT SLEEP DURING LAYOVERS***Michael Rempe¹, Ian Rasmussen¹, Kevin Gregory²,**Cassie Hilditch³, Erin Flynn-Evans², Amanda Lamp⁴*¹ Washington State University, Spokane, ² NASA Ames Research Center, ³ San Jose State University, ⁴ Washington State University

Introduction: Pilots flying long range (8-16 h) and ultra long range (16+ h) flights crossing several time zones must decide when and how much to sleep during layover between the outbound and return flight. Some pilots choose to sleep on home base time (HBT), while others attempt to sleep on local layover time. We sought broad patterns in the timing and amount of pilot sleep during layovers.

Methods: Using actigraphy, verified by self-report diaries, we collected sleep/wake data on 229 pilots (flying 460 total trips) from nine routes ranging from 10 to 17 hours in scheduled duration. All trips originated in the United States and seven were westbound routes, and two were eastbound routes. Scheduled layover durations ranged from 24 to 56 hours. We collected continuous sleep data three days before the trip, during both flights, during layover, and at least three days after the trip.

Results: Across all routes, pilots slept an average of 7 hours 58 minutes per 24 hours of layover (± 1 hour 53 minutes SD). Neither the amount nor timing of layover sleep depended on any of the following variables: 1) time (relative to home base) that the layover began; 2) direction of travel (westbound vs eastbound); 3) crew role (flying vs relief); and 4) total amount of sleep during the outbound flight. On layovers lasting 48 hours or longer, the second 24 hours showed more pilots sleeping during local night compared to the first 24 hours. Interindividual differences in the timing and amount of layover sleep were very large (larger than group differences between routes, between crews, and between flight directions.) On average, on layover days pilots obtained 17 minutes less sleep compared to pre-trip days and 32 minutes less sleep compared to post-trip days.

Conclusion: There are many complex factors that contribute to the timing and amount of layover sleep. We found that interindividual differences are larger than the variables that are constrained by the operational environment, which suggests that the timing and duration of layover sleep may be impacted more by individual traits rather than environmental or operational factors.

Support (if any): United Airlines

Abstract citation ID: zsad077.0178

0178**2B-ALERT APP: PERSONALIZED CAFFEINE RECOMMENDATIONS FOR OPTIMAL ALERTNESS***Jacques Reifman¹, Tracy Jill Doty², Ian Anlap³, William Killgore³, Francisco Vital-Lopez⁴*¹ US Army Medical Research & Development Command (BHSAI/TATRC), ² Walter Reed Army Institute of Research Sleep Research Center, ³ University of Arizona College of Medicine,⁴ The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc.

Introduction: Sleep loss causes millions of individuals around the world to carry out daily activities with impaired alertness, affecting injury risk and productivity. If properly consumed,

caffeine can safely and effectively mitigate the effects of sleep loss on alertness. However, to be effective, caffeine should be consumed at the right time and in the correct amount, depending on sleep history, work schedule and, importantly, sensitivity to sleep loss. Here, we present the 2B-Alert app, a unique smartphone application with capabilities to learn an individual's trait-like response to sleep loss and to provide personalized caffeine recommendations to optimize alertness.

Methods: We conducted a prospective 62-h total sleep deprivation study to validate the capabilities of 2B-Alert. Throughout the challenge, 21 participants used the app to measure their alertness via the psychomotor vigilance test (PVT). The app used the PVT data collected during the first 36 h of wakefulness to learn each participant's sleep-loss response and provided on-the-fly personalized caffeine recommendations (from 0 to 800 mg), so that each participant would sustain alertness at a pre-specified target level (mean PVT response time of 270 ms) during a 6-h period starting at 44 h into the challenge. To assess the effectiveness of the personalized recommendations, we computed the amount of PVT data during the 6-h period that fell within the target alertness level ± 2 times the within-subject variability of alertness impairment (i.e., ± 60 ms).

Results: We observed a wide range of responses to sleep loss, with some participants displaying high levels of resilience and others high levels of vulnerability. Accordingly, 2B-Alert recommended no caffeine to five participants, 100-400 mg to 11 participants, and 500-800 mg to five participants. Regardless of their sleep-loss response and the consumed amount of caffeine, participants sustained the target alertness level $\sim 80\%$ of the time during the 6-h period.

Conclusion: 2B-Alert automatically learns an individual's trait-like response to sleep loss and provides personalized caffeine recommendations in real time so that individuals achieve a desired alertness level regardless of their susceptibility to sleep loss.

Support (if any):

Abstract citation ID: zsad077.0179

0179**MATHEMATICAL MODELS TO PREDICT SLEEP LATENCY AND SLEEP DURATION***Jacques Reifman¹, Francisco Vital-Lopez², Thomas Balkin³*¹ US Army Medical Research & Development Command (BHSAI/TATRC), ² The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc., ³ Walter Reed Army Institute of Research

Introduction: The demands of a 24/7 society prevent millions of shift workers around the world from obtaining regular nightly sleep, negatively affecting their health, safety, and productivity. To mitigate this problem, workers should maximize the benefits of their atypical sleep opportunities. This requires assessing the ability of an individual to initiate and maintain sleep at the intended time, given their recent sleep history. Here, we present two validated mathematical models, one for predicting sleep latency and a second for predicting sleep duration, as decision aids for planning effective sleep schedules that maximize restorative sleep.

Methods: As an extension of the two-process model of sleep regulation, the proposed models predict sleep latency and sleep duration by accounting for the nonlinear interactions between homeostatic sleep pressure and the circadian rhythm. We estimated the models' parameter values for a population of young, healthy adults using

experimental data from two studies and validated the models by comparing their predictions with experimental measurements from 22 different studies, involving a variety of sleep conditions spanning the entire circadian cycle and a total of 317 unique subjects.

Results: Comparison of the sleep-latency and sleep-duration models' predictions with the experimental data showed that the models yielded acceptable average prediction errors: 4.0 minutes for sleep latency and 0.8 hours for sleep duration. Importantly, we identified conditions under which small shifts in bedtime may result in disproportionately large differences in sleep duration—knowledge that may be applied to improve productivity, safety, and sustainability in civilian and military operations.

Conclusion: By extending the capabilities of existing predictive fatigue-management tools, the mathematical models described here allow users to determine the most opportune times to sleep. This information can be used to optimize sleep efficiency, allowing shift workers to maximize the benefits of restorative sleep.

Support (if any):

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0180

THE IMPACT OF FATIGUE ON PATIENT CARE AND RISK OF POST-SHIFT DRIVING COLLISIONS AMONG 12-HOUR DAY AND NIGHT SHIFT NURSES

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Introduction: Evidence across industries links work-related fatigue with errors, accidents, and adverse long-term health outcomes. Within the healthcare profession, 12-hour day and night shifts have been widely adopted for nurses, despite concerns about fatigue from these shifts affecting nursing performance and safety. The purpose of this study was to determine the impact of 12-hour day-vs-night-shift-accumulated fatigue on patient care and driving safety.

Methods: This between-groups, repeated-measures quasi-experiment was conducted in the Washington State University (WSU) College of Nursing and Sleep and Performance Research Center. 44 nurses working 12-hour day shifts and 49 nurses working 12-hour night shifts were recruited from Providence Medical Center. Participants reported to WSU for testing on two separate occasions—once immediately following their 3rd consecutive 12-hour shift and once on their 3rd consecutive day (72 hours) off work. Nurses' sleep was monitored using wrist actigraphy, and were tested for patient care using LAERDAL medical simulation, and driving safety using an immersive driving simulator.

Results: We found that both day and night shift nurses were significantly more sleep restricted and subjectively sleepy following three consecutive shifts. Night shift nurses were significantly more impaired on patient care skills, in particular the communication domain, compared to day shift nurses (who were largely able to maintain performance across all tests). Furthermore, night shift participants had significantly greater lane deviation during the post shift drive home, a key indicator of collision risk, demonstrating impaired driving safety.

Conclusion: This study provides objective evidence of the impact of shift work-related fatigue on patient and nurse safety, allowing us to make concrete recommendations regarding safe shift-scheduling for day and nightshift nurses—information that may help keep nurses safer and improve patient care.

Support (if any):

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0181

A RELATIONSHIP BETWEEN ACADEMIC PERFORMANCE AND NIGHTTIME SLEEP IN JAPANESE UNIVERSITY STUDENTS

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Introduction: Sleep loss can cause various kinds of behavioral and psychological problems. It has been reported that sleep loss may even influence academic performance. To examine the relationship between nighttime sleep and academic performance, we conducted a questionnaire study targeting university students majoring in social sciences.

Methods: To recruit undergraduates for participation, we selected a few psychology-related classes at a university in Nagano Prefecture, Japan, and went to the classroom to ask the students to respond to a questionnaire that dealt with nighttime sleep and grade point average (GPA) as a measure of their academic performance. We approached 116 students, of whom 109 consented to participate and completed the questionnaire. The mean age of the final sample was 20.11 years old.

Results: The participants were divided into six groups: three groups based on grade and two based on sex. A two-factor analysis of variance (ANOVA) indicated that students with worse grades reported significantly shorter sleep durations than those with intermediate and better grades. It is also suggested that the male students with better grades tended to report delayed sleep schedules, that is, a later bedtime and waking time, compared to the two other male groups, while the females with better grades did not.

Conclusion: The finding strongly suggests that sleep duration may affect the academic performance of undergraduates. Sufficient sleep may result in a better academic performance and might improve the quality of our lives. In this regard, the results may be consistent with a previous study targeted high school students (Wolfson & Carskadon, 1998). In sleep hygiene education, the students should be taught to have enough sleep in every night. In addition, the finding also suggests that the Japanese male students with better grades may have a tendency to stay up late to study more, while the female with better grades may not.

Support (if any):

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0182

ADHD TRAITS AND PSYCHOMOTOR VIGILANCE AFTER 5 NIGHTS OF EXPERIMENTAL SLEEP RESTRICTION IN EARLY ADOLESCENTS: PRELIMINARY RESULTS

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Introduction: Chronic insufficient sleep is prevalent in early adolescence with potential neurobehavioral consequences. However,

individual differences examining such outcomes are understudied. Using psychomotor vigilance task (PVT) performance, we examine ADHD traits as a potential factor contributing to the vulnerability of performance following insufficient sleep in youth.

Methods: A preliminary sample of 22 children (11F; 12.25 ± 0.91 yrs) were characterized as either high [$n=10$] or low [$n=12$] on Conners-3-Parent ADHD-Probability Index [$\geq / < 50\%$ tile]. In our crossover at-home protocol, 5 stabilization nights (10h time-in-bed[TIB] set to habitual risetime) were followed by 5 nights of sleep optimization (SO; 10h TIB) or restriction (SR, 7.5h TIB; delaying bedtime and advancing risetime equally), then restabilization for 2-4 nights, and the reverse SO or SR condition. Sleep was monitored via wrist-worn actigraphy (Micro MotionLogger). Following SO or SR, participants completed a 10-minute PVT as part of a larger battery administered in the lab in late afternoon. Primary variables included: mean reciprocal reaction time (RRT), mean of the 10% fastest (FRRT), and 10% slowest (SRRT) RRTs.

Results: Mixed-effects ANOVA evaluating condition (SO vs. SR) and group (low- vs. high-ADHD) showed a significant main effect of condition ($F(1, 20)=10.91$, $p=.004$, $\eta^2=.35$) with slowed RRTs after sleep restriction ($m \pm s-d(1/s)$: $SO=3.31 \pm 0.46$; $SR=3.07 \pm 0.58$), no main effect of group or group-by-condition interaction ($ps>.42$). No significant effects emerged for FRRT ($ps>.13$); however, a significant group-by-condition interaction on SRRT ($F(1, 20)=4.78$, $p=.04$, $\eta^2=.19$) indicated that only the low-ADHD group demonstrated slower SRRT with SR ($SO=1.84 \pm 0.45$, $SR=1.61 \pm 0.54$), an effect not evident in the high-ADHD group ($SO=1.64 \pm 0.50$, $SR=1.69 \pm 0.61$).

Conclusion: These preliminary data indicate that sleep restriction on a simulated school-night schedule impairs vigilance in young adolescents as in adults. While overall SR reaction times were slower for all participants, SR impacted the slowest 10% of RTs specifically in the low-ADHD group. In ongoing analyses, we are evaluating two empirically testable explanations for this effect: (1) potential floor or ceiling effects in the high-ADHD group (2) a paradoxical hyperactivity following sleep loss in the high-ADHD group.

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0183

BEDTIME ROUTINE STABILITY IN THE CONTEXT OF DEVELOPMENTAL RISK

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Introduction: Consistent bedtime routines are an important promoter of child sleep health. This is particularly true for children developing at elevated risk for sleep and developmental challenges. Consistent and calming bedtime routines are associated with fewer parent-reported night wakings, shorter sleep onset times, and (for some) longer nighttime sleep bouts. However, few studies systematically address bedtime consistency within the context of developmental risk. To inform future sleep promotion in children with developmental concerns, this study assessed bedtime routine consistency.

Methods: Across two video-recorded bedtimes, this study assessed the consistency of routines for children ($n = 40$) with social communication concerns from ages 8-61 months, $M(SD)=$

28.14(11.76). Each child was enrolled in an eight-session Family Routines Intervention (FRI). The goals of this intervention were to improve family social communication scaffolding within family routines. Bedtime routines were coded for caregiver involvement, sleep onset location, and dyad actions.

Results: Mothers were the most common bedtime caregiver (93-95%) and her involvement was consistent for most children (96%). Father involvement was less common (present for 25-38% of recordings) and was less consistent at 56%. Other caregivers were present for roughly 18% of dyads, but their involvement was not as consistent (13%). Sleep onset location varied widely with only 33-38% sleeping in a crib, yet crib placement was moderately consistent (64%). Roughly 20% of children slept in an adult bed, with similar consistency (63%). Book reading was the most common (40-43%) and consistent (73%) bedtime action. Bedtime media use was uncommon (8-15%) but surprisingly consistent (44%).

Conclusion: For children at elevated risk for sleep and developmental concerns, bedtime routines were notably diverse and inconsistent. Although bedtime routines were not the focus of the FRI study, it afforded a unique opportunity to objectively assess how families prepare their child for bed on distinct nights across a relatively short time (8-12 weeks). Not surprisingly, mothers were the primary caregiver, highlighting her potential role in future interventions. The variability in sleep onset location and bedtime actions were notable. These areas reflect clear targets for future interventions designed to promote relatively short, calming, and consistent bedtime routines.

Support (if any): Purdue Research Foundation and the Gadomski Foundation

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0184

CAN SUBJECTIVE SLEEPINESS PRE-FLIGHT PREDICT THE USE OF CONTROLLED REST ON THE FLIGHT DECK?

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Introduction: Pilot sleepiness in flight continues to be an issue in aviation due to irregular and extended working hours. In some regions of the world, pilots are allowed to use an in-flight countermeasure called controlled rest, which involves taking a short nap on the flight deck. The use of this countermeasure in practice is understudied. We aimed to investigate whether subjective sleepiness ratings taken pre-flight are predictive of controlled rest use.

Methods: Data from 94 long (> 6 hours flight duration), non-augmented (two flight crewmembers) flights were analyzed ($n = 30$ pilots). Mixed-effects logistic regression was used to assess the likelihood of controlled rest based on a Karolinska Sleepiness Scale rating (KSS) taken at pre-flight.

Results: Controlled rest was taken on 62.77% ($n = 59$) of the analyzed flights. Pilots with higher KSS ratings (i.e., subjectively sleepier) pre-flight were more likely to take controlled rest during the subsequent flight ($b \pm SE$: 1.03 ± 0.33 ; $OR = 2.81$, 95% CI [1.47, 5.37]; $p = .002$; R^2 (Marginal): .28, R^2 (Conditional): .51). That is, for every one-unit increase in KSS ratings, there was a near three-fold increase in the odds of taking controlled rest in flight.

Conclusion: Our results suggest that subjective sleepiness prior to a flight may be predictive of the decision to take controlled rest later in the flight. Further research is needed to understand the influence of other scheduling factors and individual differences.

Support (if any): NASA Airspace Operations and Safety Program, System-Wide Safety Project.

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0185

CIRCADIAN RHYTHM OF ROCK CLIMBING SPECIFIC FINGER STRENGTH

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Introduction: Circadian rhythm influences various aspects of athletic performance; however, the sport specific effects in rock climbing are not well studied. This study aimed to evaluate circadian changes in finger strength in rock climbers. This may have important implications for timing of training and challenging climbing goals.

Methods: Participants completed two rounds of finger strength testing on the same day (morning 7-9 am and evening 5-7 pm) consisting of maximal pulls on a polyurethane training block (18 mm flat edge) anchored to a dynamometer (TindeqTM). Participants were cued to keep 4 fingers on without using the thumb and given two attempts on each hand with the highest load recorded each session. Demographic data, climbing experience level, sleep quality (Promis Sleep short form.), and chronotype (Morningness-Eveningness questionnaire) were recorded for secondary outcome analysis. Standard descriptive statistics and paired t-tests were performed to compare the morning and afternoon findings.

Results: 10 participants completed finger strength testing. There was a significant increase in mean maximum finger strength from morning ($M = 35.2$ kg, $SD = 14.8$) to afternoon ($M = 40.1$ kg, $SD = 16.1$), $t(9) = 4.1$, $p = .003$, with a large effect size (Cohen's $d = 1.3$). The mean increase was 5.0 kg with 95% confidence interval of 2.2 kg to 7.7 kg. The morning to afternoon increase in maximal strength remained significant when subdivided by sex (males $n = 6$, $p = .04$, 95% CI [0.4kg, 10.0] kg, and females $n = 4$, $p = 0.48$, 95% CI [0.1, 9.1] kg). This study lacked sufficient power to detect differences related to other secondary measures.

Conclusion: Maximum finger strength in rock climbers was greater in the afternoon compared to morning suggesting a circadian rhythm influence. Rock climbers needing peak finger strength may benefit from timing hard climbs in the afternoon rather than early morning. Further study is needed to determine if this finding is seen in larger groups or impacted by sleep quality and chronotype.

Support (if any): Training space was supported by Triangle Rock Club, Durham NC.

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0186

CONTINUOUS THETA BURST TRANSCRANIAL MAGNETIC STIMULATION AND SIGNAL DETECTION PERFORMANCE ON A MILITARY GO/NO-GO TASK

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Introduction: Repetitive transcranial Magnetic Stimulation (rTMS) is an emerging non-pharmacological treatment method utilized to treat multiple clinical diagnoses to include anxiety, depression, and now insomnia. As part of a larger project, we showed that a single rTMS stimulation with continuous theta burst stimulation (cTBS) to the default mode network (DMN) was associated with improved sleep. However, there is little known about potential effects on attention and vigilance because of cTBS to the DMN. We hypothesized that active cTBS would have no significant impact on signal detection tasks post-TMS administration.

Methods: Twenty adults with clinical insomnia completed this study ($Mage = 26.90$, $SD = 6.56$). Participants completed two overnight visits in total; one where they received active cTBS and one where they received sham cTBS over an easily accessible node of the DMN (left angular gyrus). We analyzed signal detection performance utilizing a Go-No-Go (GNG) task. Three variables were calculated as a result: hit rate, correct rejection rate, and false alarm rate. Higher scores on hit rate and correct rejection rate indicate higher correct responses. Higher scores on false alarm rate indicates a higher number of incorrect responses. We conducted a repeated measures ANOVA with factors of condition, administration, and reversal.

Results: There was no main effect of condition on GNG hit rate ($F(1,17) = 1.365$, $p = .259$, $\eta^2 = .074$), GNG false alarm rate ($F(1,17) = .210$, $p = .091$, $\eta^2 = .244$), or GNG correct rejection rate ($F(1,17) = 1.677$, $p = .213$, $\eta^2 = .090$). We also found there were no significant interaction effects of TMS condition on performance on reversal conditions for GNG hit rate ($F(1,17) = 0.45$, $p = .834$, $\eta^2 = .003$), GNG false alarm rate ($F(1,17) = 1.572$, $p = .227$, $\eta^2 = .085$), or GNG correct rejection rate ($F(1,17) = 1.510$, $p = .236$, $\eta^2 = .082$). Posthoc pairwise comparisons demonstrated that participants did not significantly differ on GNG hit rate, false alarm rate, or correct rejection rate between their active cTBS and sham cTBS session ($p > .05$).

Conclusion: Active cTBS was not significantly associated with any decline in response inhibition or signal detection. It is helpful for future recipients to know they are not adversely affected in attention or vigilance after receiving cTBS rTMS of the DMN for treatment of insomnia.

Support (if any): W81XWH2010173

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0187

HYPNOGRAMS FOR 365 NIGHTS PREDICTS SUBJECTIVE SLEEP QUALITY IN HEALTHY ADULTS: RESULTS FROM THE ULTRA LONG-TERM SLEEP (ULTS) STUDY

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Introduction: Sleep quality is fundamental to our somatic and mental health. However, the relationship between subjective sleep quality and sleep architecture remains poorly

understood. New wearable or minimally invasive technologies facilitate the recording of electroencephalography (EEG) with lower spatial resolution than standard EEG but much greater longitudinal dispersion. This enables investigation of day-to-day variation in sleep measured directly with EEG. This study will compare EEG-derived sleep parameters with covariates such as sustained attention and subjective sleep quality.

Methods: Twenty-five healthy adults were implanted with a two-channel subcutaneous EEG (sqEEG) lead. Twenty subjects completed the 1-year protocol (average 32 ± 13 years of age). Their sqEEG signals were recorded each night for 1 year alongside a morning 3-minute Psychomotor Vigilance Task (PVT) and self-reported sleep quality, which included Karolinska Sleepiness Scale (KSS). A deep learning model, U-Sleep, was fine-tuned on sqEEG with synchronized gold standard polysomnography used as ground truth. Hypnograms and sleep parameters were thus automatically calculated.

Results: Subjective sleep quality measured by KSS revealed a moderate negative correlation with rapid-eye-movement (REM) duration ($r = -0.31$, 95% CI = $(-0.31, -0.31)$), and total sleep time (TST) ($r = -0.31$, 95% CI = $(-0.31, -0.31)$). There was a moderate correlation between KSS and mean PVT reaction time ($r = 0.21$, 95% CI = $(0.21, 0.22)$). There was a low negative correlation between PVT and TST ($r = -0.1$). Preliminary results indicate a moderate correlation between sleep parameters and subjective sleep quality. The correlations with PVT were lower, which suggests that 3-minute PVT is not sensitive to TST in normal sleep. However, the correlation between PVT and KSS suggests that PVT does predict subjective sleep quality, but to a smaller degree than standard sleep parameters.

Conclusion: Measuring day-to-day variation in high-quality EEG-based sleep recordings has the potential of creating a new branch in sleep medicine. Patients can be evaluated not only by findings in a single recording but the stability and variation of all findings can be analyzed. Preliminary results suggest that subjective sleep quality can be predicted directly from sqEEG and potentially be explained by behavioral factors in a subsequent cause-effect analysis.

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0188

OBJECTIVE AND SUBJECTIVE FEATURES OF SLEEP AND BEHAVIOR IN ADULT SURVIVORS OF PEDIATRIC HODGKIN LYMPHOMA

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Introduction: Adult survivors of pediatric Hodgkin Lymphoma (HL) report poor sleep quality and excessive fatigue, often associated with obstructive sleep apnea (OSA). However, little is known about sleep dynamics in HL survivors without sleep disorders. In this exploratory study we evaluated quantitative and qualitative sleep of HL survivors without OSA and examined associations with cancer treatment and functional outcomes.

Methods: Adult participants completed two consecutive nights of in-home polysomnography (PSG) with at least 4 hours of recorded sleep. For those participants with a sleep efficiency >85%

and without OSA (HL survivors N=39, mean[SD] age=35[7.8] years; community controls N=33, age=29[7.4] years) PSG's were scored following AASM guidelines. Standardized surveys assessed subjective sleep quality (PSQI), fatigue (FACIT-F) and quality-of-life (SF-36). Group differences were evaluated using ANCOVA adjusting for age. Multivariable linear regression was used to evaluate associations between sleep and SF36 measures. Kendall correlations were computed for objective and subjective sleep and chest radiation dosimetry.

Results: No significant differences between groups were found for standard objective PSG variables (sleep stages, latency, efficiency, etc.). Compared to controls, survivors had higher mean heart rate (HR) during sleep ($p < 0.003$), higher fatigue ($p < 0.004$), and lower sleep quality ($p = 0.005$). Among HL survivors, poor PSQI ratings were associated with higher HR ($\tau = 0.36$, $p = 0.001$), lower sleep time ($\tau = -0.26$, $p = 0.019$) and increased fatigue ($\tau = -0.47$, $p < 0.001$). Higher radiation dosimetry was associated with lower PSG sleep efficiency ($\tau = -0.23$, $p = 0.042$). Among survivors and community controls, mean HR during sleep ($p = 0.049$) and lower sleep efficiency by PSG ($p = 0.032$) were associated with poorer SF36 physical health ($p < 0.001$).

Conclusion: HL Survivors demonstrate elevated mean HR during sleep, which is associated with patient reported functional limitations. Interventions to lower mean HR during sleep may have the potential to improve sleep quality, physical function, and overall quality of life.

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0189

PARTICULATE MATTER 2.5: EXAMINING HOW ITS EXPOSURE AFFECTS PERCEIVED SLEEP QUALITY AND ELECTROENCEPHALOGRAPHY BASED SLEEP METRICS

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Introduction: Individuals are exposed to various air pollutants every day, both when they are inside and when they are outside. Poor air quality can negatively impact an individual's sleep quality, especially when the individual has been exposed to Particulate Matter 2.5 (PM2.5) which can adversely affect human health due to its ability to penetrate into a human body easily.

Methods: We examined how PM2.5 exposure impacts perceived sleep quality and sleep metrics. 11 individuals (7 Female, 4 Male) with an average age 34.18 ± 10.24 years participated where each participant lived in a simulated one-bedroom apartment unit located in Rochester, MN for 20 nights in total over 4 weeks. Participants wore an EEG-based sleep headband (Dreem) to measure sleep metrics and completed surveys to assess perceived sleep quality and fatigue level each weekday after they woke up. Air quality including PM2.5 was monitored in the units from sensors and from the participants outside the units using a portable research grade air quality monitor paired with GPS. Total PM2.5 exposure was calculated each day by multiplying the PM2.5 concentration by 6 liter/min of inhalation rate and duration (min). We excluded nights with less than 5 hours of sleep duration. One participant who reported poor sleep quality over 70% of the time was also excluded.

Results: Participants had an average of $58.2\mu\text{g}\pm 63.8$ PM2.5 exposure during a day until they went to bed and $0.8\mu\text{g}\pm 2.6$ PM2.5 exposure during sleep. Because there was minimal night PM2.5 exposure, only the day exposure was correlated to sleep measures. There was no significant effect of PM2.5 exposure on sleep efficiency, sleep onset latency, wake after sleep onset, and total sleep time as measured from the Dreem headband. There was a modest but significant effect of PM2.5 on perceived sleep quality, as participants rated poorer sleep quality ($r(141)=-.17$, $p=.042$) and higher fatigue levels ($r(141)=.26$, $p=.002$) the next morning.

Conclusion: These findings suggest acute PM2.5 exposure levels were not high enough to affect sleep metrics but did affect one's perceived sleep. Future studies should examine longer period to assess whether there is a chronic effect of PM2.5 exposure on sleep.

Support (if any):

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0190

PROPENSITY FOR SLEEP INERTIA DURING SLEEP AND ITS MANIFESTATION AFTER AWAKENING IN A DYNAMIC BIOMATHEMATICAL FATIGUE MODEL

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Introduction: Sleep inertia, the transient period of cognitive impairment experienced immediately after awakening, is of concern in on-call and around-the-clock operational settings and merits development of a predictive tool to manage the associated fatigue risk. Recent work on our previously published biomathematical fatigue model revealed that predictive information about sleep inertia can be gained from tracking the propensity for sleep inertia across time spent asleep. In this approach, a neurobiological process with relatively fast dynamics (in the order of several minutes) interacts with the much slower dynamics of circadian, homeostatic, and allostatic sleep/wake regulation. Here we refine our modeling approach by mathematically dissociating the magnitude of sleep inertia from its dissipation rate.

Methods: N=280 healthy young adults (ages 21–49y) each participated in one of four laboratory studies of total sleep deprivation, sustained sleep restriction, and/or daytime napping. At 2–4 hour intervals while awake, participants performed a Psychomotor Vigilance Test (PVT), assessing number of lapses ($RT>500\text{ms}$), and rated their sleepiness on the Karolinska Sleepiness Scale (KSS). Sleep periods were recorded polysomnographically. Data were divided into a calibration set used to estimate two new model parameters capturing sleep inertia, and a validation set used to independently verify model goodness-of-fit. Sleep inertia was modeled with two ordinary differential equations – one during wakefulness to track manifest impairment, and one during sleep to track the propensity for sleep inertia upon awakening. Two parameters were fit, one modulating sleep inertia magnitude and one providing a dynamic time constant.

Results: Based on the calibration data set, the sleep inertia dissipation half-life was found to be $0.43\text{h}\pm 0.07\text{h}$. Based on the validation data set, the goodness-of-fit root-mean-square-error was 2.56 for PVT and 1.05 for KSS, indicating moderate-to-high predictive accuracy. As an emergent property of the model, the

propensity of sleep inertia first increased and then decreased over sleep time, peaking 1–2h into the sleep period.

Conclusion: A two-parameter expansion of our biomathematical fatigue model captured the transient effect of sleep inertia accurately for sleep deprivation, sleep restriction, and daytime napping scenarios, and revealed a novel, emerging dynamic of sleep inertia propensity during sleep.

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0191

SLEEP DIFFICULTIES AND SLEEP DISORDERS IN ADOLESCENT ATHLETES

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Introduction: Recent studies have shown that sleep difficulties are highly prevalent in professional and elite athletes. Unfamiliar sleeping environments when travelling, high training loads, early morning training, competitive anxiety, etc., have been mentioned as contributing factors for sleep disturbances in athletes. In addition to being susceptible to these elements, young athletes also experience changes in sleep during adolescence. However, very little is known about the sleep of this population and whether it differs from that of young adult athletes. This was the aim of the present study.

Methods: 211 young elite athletes ($M=14.9\pm 1.6$ years old; 60.4% females) completed online versions of the Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), and a modified STOP-BANG questionnaire. Summary independent T-tests were computed to compare our results to those of study samples of young adult elite athletes ($M=19.6\pm 1.5$ years old; 39.47% females) on the PSQI and ISI. Additional analyses were done to investigate differences in subgroups in the young elite athletes using t-tests and chi-squares on all measures.

Results: There was no difference between adolescents and young adult athletes for the PSQI ($t(837)=-1.50$, $p=.30$), and ISI ($t(355)=.287$, $p=.774$). Results also showed that, among young athletes, female athletes showed higher PSQI ($t(201)=3.65$; $p<.001$) and ISI scores ($t(206)=-2.27$, $p=.024$) than males, suggesting more sleep disturbances. On the other hand, male athletes as well as team sports athletes and contact sport athletes were more at risk for obstructive sleep apneas ($\chi^2(2, N=207)=73.25$, $p<.001$; $\chi^2(2, N=210)=6.08$, $p=.048$; $\chi^2(2, N=210)=14.35$, $p=.001$, respectively). Finally, athletes with ADHD showed higher PSQI ($t(203)=4.83$; $p<.001$) and ISI scores ($t(209)=2.89$, $p=.004$), and more risk of sleep apnea than athletes without ADHD ($\chi^2(2, N=207)=73.25$, $p<.001$).

Conclusion: This study shows that young adolescent athletes have the same level of sleep disturbances as young adult elite athletes. These results are very concerning because they show that from a young age, athletes are experiencing significant sleep difficulties. These findings highlight the importance of promoting early intervention with athletes who become involved at an elite level at a very young age.

Support (if any): n/a

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0192**SLEEP HYGIENE AND SELF-EFFICACY FOR SLEEP HYGIENE AMONG GOOD AND POOR SLEEPERS: A SECONDARY ANALYSIS**Christine Gipson¹, Suzanne Dickerson²¹ The University of Texas at Tyler, ² University at Buffalo School of Nursing

Introduction: College students are at risk for sleep disturbances that may influence academic performance and cognitive function. Poor sleep hygiene and sleep quality over time results in inadequate sleep and daytime sleepiness, which, if not addressed, eventually leads to sleep deprivation and adverse health effects. The current study aims to identify if sleep hygiene practices and self-efficacy relate to poor and good sleepers categorized according to the Pittsburgh Sleep Quality Index (PSQI) Score $>$ or $<$ 5) among a sample of college students.

Methods: Secondary analysis of baseline data from college student participants aged 18-26 from an intervention study was used. All participants completed demographic, sleep hygiene, and sleep quality assessments. (e.g., Sleep hygiene index [SHI], Self-efficacy for sleep hygiene inventory [SHESHI], and PSQI). Descriptive statistics were calculated for demographic, sleep quality, and sleep hygiene variables.

Results: The sample ($n=119$) included 15 Freshmen, 30 Sophomores, 52 Juniors, and 21 Seniors, of which 26 were male and 93 female college students. The total sample mean age=20.6 y $\pm$ 2.0, range: 18-26; 82.4% were White, 55% worked part-time, and 69.8% considered themselves night owls. Data were examined to determine if poor and good sleepers differed across key demographic variables. There were no statistically significant differences between the groups. The sample comprised 47.0 % ($n=56$) poor sleepers and 52.9% ($n=63$) good sleepers. A Mann-Whitney U test was run to determine if there were differences in self-efficacy scores and sleep hygiene practices between poor and good sleepers. Mean rank self-efficacy scores for poor sleepers (44.15) were significantly lower than for good sleepers (74.09), $U=876$, $z = -4.725$, $p < .001$. Mean rank sleep hygiene index scores for poor sleepers (76.05) were significantly higher than good sleepers (45.73) $U=865$, $z = -4.793$, $p < .001$.

Conclusion: Preliminary descriptive findings highlight significant characteristics of sleep hygiene efficacy in college students with good and poor sleep. All surveys were subjective measures. Future use of an objective measure of actual sleep time and sleep health index would add to an understanding of sleep issues in college students.

Support (if any): N/A

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0193**SLEEP PROFILES OF DRINKING AND NON-DRINKING COLLEGE STUDENTS**Andrea Spaeth¹, Kelsey Piersol¹, Anthony Pawlak¹,Jennifer Buckman¹¹ Rutgers University

Introduction: Alcohol use and insufficient sleep are prevalent in American college students and studies suggest that these behaviors are reciprocally interrelated. However, there is limited information about the relationship between sleep and alcohol use in

college students without sleep or alcohol disorders. This study aimed to characterize the relationship between sleep and alcohol use in healthy college students by considering the effects of using alcohol on same-day nocturnal sleep, next-day nocturnal sleep, and napping.

Methods: Thirty-one college students ($n=12$ consumed alcohol during the study, $n=19$ did not) completed twice-daily online diary reports and wore a wrist-actigraphy device across two weeks. Linear mixed models examined person-specific (e.g., drinker or non-drinker) and event-specific (e.g., drinking or non-drinking night; school or free night) effects of alcohol use on subjective and objective sleep outcomes.

Results: When averaged across all nights, sleep behavior did not differ between drinkers and non-drinkers ($ps>0.05$). On drinking nights, participants went to bed later ($p < 0.05$) but woke up at similar times compared to non-drinking nights, resulting in significantly shorter sleep durations on drinking nights ($p < 0.05$). There were no effects of alcohol use on subjective sleep quality or daytime sleepiness ($ps>0.05$) or on next-day nocturnal sleep variables ($ps>0.05$). Daytime sleep (i.e., napping) was observed in 25 (81%) participants. The proportion of nappers and number of naps per participant did not significantly differ by drinking status ($ps>0.05$). There were also no differences in actigraphy-derived daytime sleep variables between drinkers and non-drinkers ($ps>0.05$). Among drinkers who napped ($n=9$), naps were taken on 27% of days following drinking nights and on 17% of days following non-drinking nights ($p>0.05$).

Conclusion: This study bolsters prior reports that insufficient nocturnal sleep and daytime napping are common in college by validating self-reported sleep behaviors with objective actigraphy data. Efforts to convey the importance of proper sleep are still needed in the college context. Future research should examine consequences of layering acute bouts of excessive alcohol consumption onto insufficient nocturnal sleep.

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0194**SLEEP TRACKER: HOW ACCURATE DOES IT NEED TO BE?**Jaques Reifman¹, Francisco Vital-Lopez², Nikolai Priezev²¹ US Army Medical Research & Development Command (BHSAI/TATRC), ² The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc.

Introduction: Commercial sleep tracker devices offer the ability to measure an individual's sleep patterns, providing a portable and low-cost option to collect sleep-wake data to enhance fatigue management and minimize alertness impairment. While multiple studies have reported that sleep parameters estimated with these devices differ from gold-standard polysomnography (PSG), the extent to which these differences are acceptable is not known. Here, we provide a method to quantitatively assess whether sleep-duration errors generated by sleep trackers hinder our ability to assess alertness impairment.

Methods: To obtain representative statistics of sleep-duration errors, we performed a literature review and identified 14 studies that compared estimations of sleep parameters between 18 unique commercial sleep trackers and PSG. Then, we used the well-validated Unified Model of Performance (UMP), a mathematical model that predicts alertness impairment as a

function of sleep history, to quantitatively assess the effect of sleep-duration errors on alertness predictions. For this purpose, we performed 20,000 simulations in which an individual slept 8 hour per night for 30 consecutive days. Each day, we randomly sampled sleep-duration errors using the obtained representative statistics and computed daily alertness-prediction errors. We repeated these simulations for 5 and 9 hours of sleep per night. We assumed that sleep-duration errors that lead to alertness-prediction errors of ≤ 30 ms (i.e., the within-subject variability under well-rested conditions) are not a concern.

Results: Based on the 14 studies, sleep trackers yielded sleep-duration errors with a mean of 22 minutes and a standard deviation of 44 minutes. Using these statistics to sample daily errors, we found that, at the end of the 30 days of UMP simulations, these sleep-duration errors led to a mean alertness-prediction error of ~ 20 ms, with $\sim 75\%$ of the errors ≤ 30 ms. We also found that, for each additional minute of sleep-duration error, the prediction error increased by ~ 1 ms. These results were consistent when the hours of sleep per night varied from 5 to 9 hours.

Conclusion: On average, sleep trackers lead to alertness-prediction errors that are consistently smaller than the within-subject variability of alertness impairment, suggesting that they are an alternative approach for measuring sleep duration.

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0195

THE ASSOCIATION OF ELECTRONIC DEVICE USE BEFORE BEDTIME ON OBJECTIVE SLEEP QUALITY MEASURED WITH ODDS RATIO PRODUCT

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¹ Cerebra

Introduction: Previous research has shown mixed results when it comes to electronic device use and the impact on sleep quality. The use of electronic devices before bedtime can impact sleep quality through engaging content and the impact of blue light on melatonin secretion. In the present study, we assessed the relationship between electronic device use and sleep under real-world conditions.

Methods: Nineteen participants (age 41.1 ± 10.9 ; 9 females) recorded their sleep with in-home PSG using the Cerebra Sleep System for 18 to 31 nights (21.5 ± 3.4). Sleep quality was measured using odds ratio product (ORP) derived from spectral analysis of the frontal EEG channels during wake, NREM and REM sleep. Participants completed a nighttime questionnaire within one hour of bedtime where they were asked "Did you do any of these activities today" and indicated "social media or surfed the internet in the last hour before bedtime". The Karolinska Sleepiness Scale (KSS) was also completed during the before bedtime test battery.

Results: Across the 19 participants, 17 participants reported using social media or surfing the internet within an hour before bedtime for at least one night. Participants reported usage for 9.6 ± 8.2 nights on average ($n=165$) but no usage for 11.7 ± 7.9 nights on average ($n=210$). On nights that internet or social media usage before bedtime was reported, participants had lower levels of evening sleepiness on the Karolinska Sleepiness Scale than on nights where no usage was reported ($p < .001$). On these nights, participants also had higher ORPNREM ($p < .001$), higher ORPREM ($p < .001$), higher ORPTRT ($p < .001$), higher

ORP-9 ($p < .001$) which is an indication of poorer sleep depth after an EEG arousal.

Conclusion: On the nights when electronic devices were used before bedtime, participants experienced less sleepiness and had worse objective sleep quality during the night. These results indicate the utility of ORP to be sensitive enough to detect changes in sleep quality after electronic device use.

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0196

THE RELATIONSHIP BETWEEN BRAIN FUNCTIONAL CONNECTIVITY AND OBJECTIVE AND SUBJECTIVE ASSESSMENTS OF CHRONIC HABITUAL SLEEP STATUS

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Introduction: Sleep is a multiscale phenomenon. It has subjective and objective components often not highly correlated. Given the importance of brain networks for cognition and evidence that sleep deprivation and variability in habitual sleep patterns affects Functional brain Connectivity (FC), we would expect brain networks would be differentially related to subjective and objective markers of sleep. As well as region specific studies, investigating the effect of habitual sleep measures across whole network interactions is important. This study investigates whether overall FC from 3 Intrinsically Connected Networks (ICN); Default mode(DMN), Salience(SN) and Central executive(CEN) network is differentially related to subjective and objective sleep measures from sleep quality questionnaire, sleep diary data and actigraphy metrics.

Methods: Functional Magnetic Resonance Imaging data acquired from 32 healthy adults (right handed, 14 female, age 23-59 years). Regions of interest (ROI) representing nodes of the ICN created from separate data of 55 subjects (28 male, age 25 ± 4 yrs). Seed-based FC analysis performed using in-house MATLAB code. Average FC across all paired connections in each ICN calculated to define overall mean FC. Two-way multiple measures factorial ANOVA split-plot analysis performed with a $2 \times 3 \times 6$ design to determine any interaction of 6 sleep measures (Pittsburgh sleep quality index, subjective sleep efficiency, diary total sleep time, wake after sleep onset, total sleep time, sleep efficiency) with the FC of the ICN. Pairwise comparisons for significant interactions and univariate analysis on the linearly independent pairwise comparisons among the estimated marginal means performed to confirm significant interactions between ICN FC and sleep measures.

Results: No significant interactions for any of the sleep metrics tested, subjective or quantitative ($P \geq 0.05$). Except subjective sleep efficiency (SSE) which demonstrated a significant within subject interaction of overall network FC ($F(2,30) = 3.682$, $P = 0.033$, $\eta^2 = 0.109$) for CEN.

Conclusion: Significant findings of SSE in relation to CEN demonstrate increased FC of the CEN in relation to higher SSE and lower CEN FC in subjects with low SSE. Overall findings suggests FC changes within ICN in relation to chronic habitual sleep status metrics (subjective or quantitative) don't involve whole network FC, therefore we believe them to be region specific.

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0197

TO DELAY PERCHANCE TO SLEEP: THE DAILY ASSOCIATION BETWEEN PRE-SLEEP AROUSAL AND BEDTIME PROCRASTINATIONSteven Carlson¹, Kimberley Johnson¹, Paula Williams¹¹ University of Utah

Introduction: Bedtime procrastination, a behavior associated with poor sleep health and wellbeing, refers to voluntary delays of bedtime. Although bedtime procrastination is often defined as a needless or mindless delay, bedtime procrastinators often report delaying their bedtime strategically to regulate sleep-interfering processes. One such process is pre-sleep arousal, an important vulnerability for and perpetuating factor in insomnia. Preliminary evidence supports this association, as some bedtime procrastinators report delaying bedtime to avoid anxiety-producing bedtime routines. However, this association has not been directly examined. To further investigate strategic delay in bedtime procrastination, the current study examined the association between pre-sleep arousal and bedtime procrastination using a daily diary design.

Methods: 390 young adult participants (Mage = 24.4, SD = 6.5) completed 14-days of experience sampling procedures, including completing self-report measures of nightly pre-sleep arousal and morning ratings of prior-night bedtime procrastination. Associations between pre-sleep arousal and bedtime procrastination were estimated with multilevel models using centering procedures which disaggregated between- and within-person covariance. Gender and age were entered into each model as covariates.

Results: Pre-sleep arousal was associated with increased bedtime procrastination both within- ($B = 0.01$, $p < 0.001$) and between-persons ($B = 0.02$, $p < 0.001$). Additionally, cognitive pre-sleep arousal was more strongly associated with bedtime procrastination ($B_{\text{within}} = 0.014$, $p < 0.001$; $B_{\text{between}} = 0.032$, $p < 0.001$) than somatic arousal ($B_{\text{within}} = 0.007$, $p = 0.165$; $B_{\text{between}} = 0.038$, $p < 0.001$).

Conclusion: The results suggest that pre-sleep arousal is a putative mechanism for bedtime procrastination. Cognitive arousal, including worry and rumination, may be particularly relevant for the development of this behavior. This finding supports the notion that bedtime procrastination may occur as a (maladaptive) strategy to regulate pre-sleep arousal. Alternatively, findings may suggest that bedtime procrastinators engage in arousing pre-sleep activities. Regardless, the association between bedtime procrastination and pre-sleep arousal suggests that bedtime procrastination is relevant in the development and/or maintenance of sleep-related disorders. Treatment of bedtime procrastination may be enhanced by considering the role this behavior has in regulating pre-sleep arousal.

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0198

EFFECTS OF A 1-HOUR NIGHTLY WEEKLONG SLEEP EXTENSION PILOT STUDY IN UNDERGRADUATES ON HEALTH

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Introduction: Sleep restriction impairs health, but less is known about the potential health benefits of extending sleep in undergraduate students with habitual short sleep. This study examined the effects of a 1-week, 1-hour per night sleep extension on cardiometabolic health, hydration status, sedentary behavior, and physical activity in undergraduate students.

Methods: Twelve healthy undergraduate students (83% female; mean±SD age 20.2±1.5; range 18-23 years) obtaining fewer than 7 hours of average nightly sleep completed a two-week study. The first week consisted of sleeping typically ("Habitual"), followed by a peer-delivered intervention to extend time in bed by ≥1 hour/night during the second week ("Extension"). Sleep and physical activity actigraphy were collected throughout. Following each week, participants completed in-person cardiometabolic assessments, including a standardized meal response procedure and blood pressure measurement. Blood samples for measurement of glucose and insulin were collected before, during, and following a standardized breakfast. Urine samples yielded markers of hydration (specific gravity and osmolality). Mixed-effects regression models with random intercepts for individuals compared outcomes after the Extension week to Habitual outcomes.

Results: Compared to Habitual sleep, average sleep duration across the Extension week increased (b±SEM, +42.6±3 minutes; p=.005). After the breakfast meal, glucose area under the curve (AUC; -26.5±10.2 mg/dL*h; p=.025) and time to return to baseline levels (-83.0±46.4 minutes; p=.031) decreased following Extension. There was no change in insulin AUC. Systolic blood pressure decreased (-6.6±2.8 mmHg; p=.037) after Extension. Average time spent in sedentary behavior (-44.3±15.7 minutes; p=.018) and percentage of wake spent in moderate-to-vigorous physical activity (-1%±.4%; p=.030) decreased across the Extension week. Participants who increased average sleep duration ≥15 minutes (n=9) were better hydrated according to urine osmolality (-187.0±68.4 mOsm/kg; p=.026) and specific gravity (-.01±.002 g/mL; p=.012) and had lowered odds of dehydration according to urine osmolality (≥800 mOsm/kg; -67%; OR=.03; p=.035).

Conclusion: This pilot study provided evidence that sleep extension may improve cardiometabolic health and hydration and reduce both sedentary behavior and moderate-to-vigorous physical activity. Future research in randomized controlled trials should examine if such findings extrapolate to larger samples and older populations.

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0199

EFFECTS OF ACUTE SLEEP DEPRIVATION ON COGNITIVE PERFORMANCE IN DEPRESSED INDIVIDUALS

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Introduction: Acute sleep deprivation (SD) is an effective, rapid antidepressant treatment. However, SD has adverse effects on cognitive performance. The effects of SD on cognitive performance in depression remain underexplored. This study investigated relationships between depression and performance on Cognition – a neurocognitive battery of 10 tests that cover a range of cognitive domains – during acute SD.

Methods: Thirty-six individuals with current depression (69.4% female; 33±9.5 yrs) and 10 euthymic controls (40% female; 35±9.5 yrs) underwent a baseline night of sleep followed by 36 hours SD in the laboratory. Participants completed the Cognition battery twice after each protocol night. Each of the 10 Cognition tests has two separate metrics of performance: speed and accuracy. Multivariable linear regressions were used to assess effects of depression status, age, and gender on each performance metric at baseline. Mixed effects models were used to assess effects of depression status, sleep deprivation, and their interaction on performance metrics. All models included a random effect over participants and were adjusted for age, gender, and time of day.

Results: At baseline, depressed individuals were significantly faster than controls on three tests of working memory ($\beta=-72.6$; $p=0.03$), spatial orientation ($\beta=-2944.7$; $p=0.01$), and emotion recognition ($\beta=-537.5$; $p=0.005$) respectively, although these effects did not survive correction for multiple comparisons. Mixed effects model results revealed a significant effect of depression status on the speed metric from the spatial orientation test, whereby depressed individuals were faster across the protocol ($\beta=-2579.6$; $p=0.04$) and a significant interaction effect between depression status and study day on the speed metric from a risk-taking behavior test, whereby depressed individuals were slower after SD ($\beta=480.9$, $p=0.01$); neither effect survived correction for multiple comparisons. However, sleep deprivation was significantly associated with reductions in performance in models for 10 out of 20 metrics (all adjusted $ps < 0.05$).

Conclusion: These results suggest that currently depressed individuals exhibit the same decrements in cognitive performance after acute SD as non-depressed individuals. Future analyses will examine whether baseline depression severity predicts cognitive performance and whether differences in performance exist between SD responders versus non-responders.

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0200**EFFECTS OF EARLY-LIFE SLEEP DISRUPTION ON SPATIAL LEARNING, TAU BURDEN, AND NEURODEGENERATION IN THE PS19 MOUSE MODEL OF TAUOPATHY**Kenny Vetter¹, Ward Pettibone², Rachel Tejiram¹, Korey Kam¹, Andrew Varga¹¹ Icahn School of Medicine at Mount Sinai, ² UCLA

Introduction: Sleep disruption is thought to increase tau hyperphosphorylation and tangle formation. This study aims to identify the impact of chronic early-life sleep disruption on late-life tau burden, neurodegeneration, and spatial memory.

Methods: Eight-week-old PS19 (MAPT P301S) mice and wildtype littermates were subjected to chronic daily sleep disruption (SD) or allowed to sleep ad libitum (AL) for eight weeks. SD was achieved using an automated physical stimulus every 10 seconds for 18 hours daily between ZT 0 and 18. Spatial memory testing occurred at 6, 8, and 10 months of age using the Barnes maze where latencies to find and enter the escape box were recorded on 4 consecutive days (n: WT AL=22, WT SD=21, PS19 AL=15, PS19 SD=28). Brains were subsequently collected between 10 and 14 months of age and analyzed in a subset. Tau pathology was analyzed with AT8 immunohistochemistry on paraffin sections and quantified by counting tau-positive hippocampal neurons using QuPath software. Neurodegeneration was quantified by measuring the combined area of both the lateral and third ventricles.

Results: Spatial memory was equivalent among all genotypes and sleep conditions at 6 months. We observed a main effect of PS19 genotype with worse spatial memory at 8 and 10 months. Notably, early life SD imparted a protective effect on spatial memory at 8 and 10 months vs ad lib sleep in PS19 mice with no effect on controls. PS19 mice experiencing early life SD showed no difference in late-life hippocampal tau burden (SD: mean 462 AT8+ neurons (SEM: 268), n=5, AL: 284 AT8+ neurons (SEM: 98), n=5, p=0.56) as well as no difference in total ventricle area (SD: mean 1.2 square mm (SEM: 0.5), n=5, AL: 2.0 square mm (SEM: 0.4), n=5, p=0.26).

Conclusion: Counter to our initial hypothesis, early-life SD resulted in preservation of late-life spatial memory, without changes to neurodegeneration as measured by ventricle area or changes to tau hyperphosphorylation in the hippocampus. Dissociation of tau burden and memory has been observed in models of immune modulation suggesting further investigation regarding effects of sleep disruption on immune function in the context of neurodegenerative models.

Support (if any):

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0201**PREBIOTIC DIET IMPACT ON COGNITIVE PERFORMANCE, SLEEPINESS, AND MOOD DURING COMBINED SLEEP RESTRICTION AND CIRCADIAN MISALIGNMENT**Sarila Ekin¹, Dana Withrow², Abhignya Kuppa², Kate Sprecher³, Monika Fleshner¹, Antonio Gonzalez⁴, Christopher A. Lowry¹, Fred Turek⁵, Martha Vitaterna⁵, Pieter C. Dorrestein⁴, Rob Knight⁴, Kenneth Wright⁶¹ University of Colorado Boulder, ² University of Colorado,³ Eversana Intouch, ⁴ University of California San Diego, ⁵Northwestern University, ⁶ University of Colorado, Department of Integrative Physiology, Boulder Colorado

Introduction: The gut microbiome plays a crucial role in health and affects mood and behavior. The composition and function of the gut microbiome can be modified by prebiotics, which are defined as substrates selectively utilized by host microorganisms conferring a health benefit. This study examined the effects of a prebiotic diet combination of polydextrose (PDX) and galacto-oligosaccharides (GOS) on cognitive performance and sleepiness during combined sleep restriction and circadian misalignment.

Methods: Eleven healthy adults (aged 24.6 ± 4.5 , 6 females, 5 males) completed a randomized, double-blind, cross-over study lasting a total of 39 days. Participants consumed 14 days of prebiotic (7.5g/day each of PDX [Danisco] and GOS [FrieslandCampina]) or maltodextrin placebo diets at home (sachets dissolved in water with breakfast) while maintaining ~8h sleep per night at habitual times for two separate weeks before undergoing ~4 days of in laboratory testing under combined sleep restriction (3h sleep opportunity per day) and circadian misalignment (wakefulness at night) conditions. Prebiotic or placebo diet continued in-laboratory. Cognitive function testing occurred every 3h during scheduled wakefulness and included the Psychomotor Vigilance Task (PVT), Stroop Color and Word Test (STROOP) visual analog mood scales (VAS), positive and negative affect scales (PANAS), and the Karolinska sleepiness scale (KSS). Participants had a 3-day washout, then repeated the same procedure with the second condition.

Results: Sleepiness on the KSS was reduced, and positive mood on the PANAS and calm mood were increased under prebiotic versus placebo (all $p < 0.05$). Median reaction time on the PVT was faster, whereas median reaction times for congruent stimuli on the STROOP task were slower under the prebiotic diet versus placebo (all $p < 0.05$).

Conclusion: A prebiotic diet had beneficial effects on many performance, sleepiness and mood outcomes during combined sleep restriction and circadian misalignment. These findings have important implications for shift workers, emergency responders, and military personnel working under the demanding conditions of sleep restriction and circadian misalignment.

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0202**SLEEP DEPRIVATION: COGNITIVE DECLINE AND HIPPOCAMPAL NEUROINFLAMMATION**Laura Olsen¹, Hunter McCubbins¹, Raquel Moore¹, Nathan Gargas², Joyce Rohan², Candice Hatcher-Solis¹¹ Air Force Research Laboratory, ² Naval Medical Research Unit Dayton

Introduction: A highly conserved biological process, sleep is imperative for healthy brain function. Sleep deprivation (SD) disrupts cognition and increases susceptibility to neurological disorders. The first step to developing mitigation strategies, this

study investigated mechanisms underlying sleep-induced cognitive impairment, including hippocampal neuroinflammation.

Methods: All animal activities were approved under an IACUC protocol. Male Sprague-Dawley rats ($N = 50$) underwent 120 h of SD. Novel Object Recognition (NOR) and Passive-Avoidance Task (PAT) assessed cognitive performance ($n = 6-12$), followed by humane euthanization. Protein analysis of hippocampal tissue was performed using immunohistochemistry (IHC, $n = 3-6$) and enzyme-linked immunoassay (ELISA, $n = 8-13$). Microglia (Iba-1 marker) and astrocyte (GFAP marker) populations were quantified using IHC and ImageJ. The ELISA V-PLEX assay was used to assess concentration of pro-/anti-inflammatory mediators.

Results: Tested 24 h after training, SD rats had significantly lower cognitive performance in NOR ($p < 0.05$) and PAT ($p < 0.01$). Percentage of Iba-1+ microglia in the stratum radiatum of CA1 ($p < 0.05$) and CA2 ($p < 0.05$) hippocampal subregions was higher among SD rats. This SD-induced increase in microglia was not found in the pyramidal layer of CA1/2/3 ($p > 0.05$). There was no SD-associated change in percentage of GFAP+ astrocytes in any hippocampal subregion ($p > 0.05$). ELISA analysis found SD rats had higher levels of pro-inflammatory chemokine ligand 1 (CXCL1, $p < 0.05$) and anti-inflammatory interleukin-10 (IL-10, $p = 0.07$) in the hippocampus.

Conclusion: SD-induced cognitive impairment was associated with increased microglia presence in CA1/2 subregions of the hippocampus. Increased expression of hippocampal CXCL1 after SD indicates these CA1/2 microglia are pro-inflammatory, leading to neuroinflammation in regions that mediate declarative memory. Although IL-10 trended to increase after SD, this neuroprotective anti-inflammatory factor did not prevent SD-induced performance decline or microglia recruitment. Based on these findings, it is suggested that blocking pro-inflammatory microglia pathways in the CA1/2 may prevent SD-induced cognitive dysfunction.

Support (if any): AFOSR grant 20RHCOR04

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0203

TIME-IN-BED CLASSROOM CHALLENGES: INCENTIVIZING UNDERGRADUATE STUDENTS TO IMPROVE SLEEP DURING FINAL EXAMS WEEK

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Introduction: Late bedtimes and all-nighters are ingrained into student culture, especially during final exam week. We previously found that extra credit incentives “to sleep 8 hours” encouraged longer sleep durations in small-sized classes. The current work investigated whether a modified approach—extending one’s time-in-bed—was scalable to larger-sized classes and dependent on the size of the incentive.

Methods: Across two studies, 129 undergraduate students completed baseline actigraphy and sleep diary monitoring early in Fall 2021 or Fall 2022. At the end of the semester, students could opt to take a time-in-bed challenge to earn large-sized (8 points; Study 1) or medium-sized (5 points; Study 2) extra credit on their final exam if they maintained an average time-in-bed of nine hours (or average total sleep time of eight hours). A smaller-sized extra credit (2 points) could be earned if the overall benchmarks were not met but

one still improved on their baseline sleep duration by 20 minutes or sleep efficiency by 3%. Participants provided informed consent and the class instructor was kept blinded until after exams were graded.

Results: Most students attempted the time-in-bed sleep challenge (Study 1: 86.79%; Study 2: 92.11%). In Study 1, large-sized extra credit encouraged a 66 minute/night improvement in actigraphy-defined total sleep time from early-semester baseline (6.72 ± 1.18 hours) to final exams week (7.82 ± 0.89 hours; $p < .001$). In Study 2, a medium-sized extra credit opportunity improved actigraphy-defined total sleep time by 46 minutes/night from baseline (6.69 ± 0.80 hours) to finals week (7.46 ± 1.12 hours; $p < .001$). The interaction with incentive size was non-significant ($p > .05$). Sleep efficiency was similar across timepoints in Study 1 (83.6 ± 5.35 to 82.8 ± 5.18 , $p > .10$) and Study 2 (82.9 ± 6.1 to 82.9 ± 6.47 , $p > .10$). Students did not have to sacrifice total sleep time to perform well on their final exams ($r < .10$); interestingly, students with higher sleep efficiencies performed better on their final exams ($r = .28$, $p < .05$).

Conclusion: The all-nighter culture of final exam week can be overcome by creating incentives for students to prioritize nighttime sleep.

Support (if any): National Science Foundation (1920730 and 1943323).

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0204

ASSOCIATIONS OF REALLOCATING SEDENTARY OR ACTIVITY TIME TO SLEEP ON BODY WEIGHT IN POSTPARTUM WOMEN

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Introduction: In the postpartum period, decreased sleep time is associated with increased postpartum weight retention. Increasing sleep time in the postpartum period may be beneficial; however, increasing total sleep time will reduce the time available for light physical activity (LPA), moderate to vigorous activity (MVPA), or sedentary behavior (SED). Therefore, the purpose of this study was to examine the associations of reallocating time in SED, MVPA, and LPA to sleep with body weight in postpartum women.

Methods: Women ($n = 130$) who gave birth to a singleton infant at ≥ 37 weeks gestation participated in the study. At 6-8 weeks, 6 months, and 12 months postpartum wrist actigraphy was used to measure total sleep time and hip actigraphy was used to measure SED, LPA, and MVPA. Women were instructed to wear the monitors for 7 days and maintain their normal daily activities. Weight was measured at each timepoint using a calibrated scale. Isotemporal substitution models were preformed to examine the association of reallocating time to sleep from SED, LPA, and MVPA on body weight.

Results: At 6-8 weeks, reallocating ten minutes of SED or MVPA to sleep was associated with a -0.54 kg ($p = 0.0223$) and -3.33 kg ($p = 0.0091$) change in body weight, respectively. At 6 months, reallocating ten minutes of SED or MVPA to sleep was associated with a -0.931 kg ($p = 0.0069$) and -2.97 kg ($p = 0.0434$) change in body weight, respectively. At 12 months, reallocating ten minutes of SED to sleep was associated with

a -1.21 kg ($p=0.0166$) change in body weight. Reallocating time from MVPA to sleep was not associated with changes in body weight at 12 months. Reallocating time from LPA to sleep was not associated with changes in body weight at any timepoint.

Conclusion: Throughout the first year postpartum, reallocating time from SED to sleep was associated with decreases in body weight. Surprisingly, reallocating time from MVPA to sleep was also associated with a decrease in body weight at 6-8 weeks and 6 months postpartum. These results suggest the relative importance of the behaviors comprising the 24-hour day to body weight may be changing over the first year postpartum.

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0205

CATECHOL-O-METHYLTRANSFERASE GENOTYPE, BUT NOT DOPAMINE RECEPTOR D2 GENOTYPE, MODULATES SLOW WAVE SLEEP

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Introduction: Slow wave sleep (SWS), a putative marker of sleep homeostasis, robustly increases following total sleep deprivation (TSD). The neurotransmitter dopamine is substantively involved in sleep-wake regulation. Single nucleotide polymorphisms (SNP) in the dopaminergic genes of dopamine receptor D2 (DRD2) and catechol-O-methyltransferase (COMT) have been found to alter dopamine availability primarily in the striatum and prefrontal cortex (PFC), respectively. Here, we investigate if these SNPs are associated with changes in SWS at baseline and following TSD.

Methods: N=105 healthy adults (ages 26.5 ± 5.0 ; 55 females) completed one of three 4-day/3-night in-laboratory studies with 10h baseline sleep opportunity (22:00–08:00), 38h TSD period, and 10h recovery sleep opportunity. Sleep periods were recorded polysomnographically and visually scored according to AASM criteria. DNA isolated from whole blood was assayed for DRD2 (C957T, rs6277) and COMT (Val158Met, rs4680) genotypes using real-time PCR. For each genotype, SWS duration was analyzed using mixed-effects ANOVA with fixed effects for genotype, night (baseline vs. recovery), and their interaction, controlling for study, and a random effect over subjects on the intercept.

Results: DRD2 genotypes (25 C/C, 52 C/T, 28 T/T) and COMT genotypes (23 Val/Val, 58 Val/Met, 24 Met/Met) were in Hardy-Weinberg Equilibrium. As expected, SWS was substantially increased during recovery sleep compared to baseline. There was no main effect of DRD2 ($F[2,102]=2.78$, $p=0.07$), nor interaction of DRD2 by night ($F[2,102]=1.45$, $p=0.24$). However, there was a significant main effect of COMT on SWS duration ($F[2,102]=3.20$, $p=0.04$), without interaction of COMT by night ($F[2,102]=1.43$, $p=0.24$). Compared to Met allele carriers, Val homozygotes displayed reduced SWS duration during both baseline and recovery sleep.

Conclusion: The DRD2 T allele is associated with decreased dopamine D2 receptors and decreased dopaminergic signaling in the striatum relative to the C allele. The COMT Val allele is associated with increased enzymatic activity and decreased dopaminergic signaling in the PFC relative to the Met allele. Our results indicate that compared to striatal dopamine, PFC dopamine

may be a more prominent mediator of SWS regulation, with less PFC dopamine corresponding to less SWS. This needs to be confirmed in a larger sample.

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0206

2021 ANALYSIS OF THE MEDIATING EFFECT OF SLEEP ON THE RELATIONSHIP BETWEEN EXERCISE AND FREQUENT MENTAL DISTRESS

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Introduction: Adolescents are at an increased risk of frequent mental distress, defined as experiencing poor mental health such as stress, anxiety, and depression, due to a variety of factors. In 2021 it was shown that the prevalence of frequent mental distress was higher than in previous years (NM-YRRS, 2021). According to Paruthi et. al. (2016), Adolescents require 9 to 10 hours of sleep per night. However, during the school year, the average sleep duration for adolescents is between 6.5 and 8.5 hours per night (Brand et. al., 2010). One potential solution to improve adolescent sleep is frequent moderate to vigorous exercise, which has been shown to have a positive relationship with favorable and healthy sleep patterns in adolescents. (Brand et al., 2010). Due to early school days, insufficient sleep has been found to contribute to frequent mental distress and poor academic performance in adolescents (Blackwelder, Hoskins & Huber, 2021). Aerobic exercise has been demonstrated to regulate emotions, while decreased rates of exercise have been shown to increase suicidality (Siddiqui, et. al., 2022). Thus, we hypothesize that inadequate exercise puts youth at an increased risk of frequent mental distress via the pathway of insufficient sleep. We further anticipate that boys and girls will experience this relationship at a different magnitude, with girls experiencing the effects of insufficient exercise on sleep more intensely because of gender-based differences in sleep duration requirements (Brand, et. al., 2010).

Methods: Using the 2021 New Mexico Youth Risk and Resiliency Survey (NM-YRRS) high school dataset, we will analyze this association using logistic regression. The NM-YRRS includes 16,000 students from across New Mexico high schools. Subgroup analyses are important considering evidence that there is a greater prevalence of frequent insufficient sleep among Native Americans (Chapman et al., 2013). The NM-YRRS oversamples Native American and rural populations in the state to ensure more representation of these populations than other surveys provide. The national CDC's Youth Risk and Behavior Survey data across the United States will be available in January of 2023 where we will compare New Mexico's data to National data.

Results: TBA

Conclusion: TBA

Support (if any):

Abstract citation ID: zsad077.0207

0207**ACUTE TOTAL SLEEP DEPRIVATION ADVERSELY IMPACTS CARDIOVASCULAR MEASURES ACROSS LONG-DURATION INTERVALS**Namni Goel¹, Kathleen Rosendahl-Garcia², Lauren Pasetes¹¹ Rush University Medical Center, ² Siemens Healthineers, Inc.

Introduction: For the first time, we comprehensively investigated the effects of repeated exposures to baseline (BL), total sleep deprivation (TSD), and recovery (REC) phases at 2, 4, and 8 months on cardiovascular (CV) measures.

Methods: We conducted a five-day experiment twice (at months 2 and 4) in a 4-month study (N=6 healthy adults; 3 females), and a similar five-day experiment three times (at months 2, 4, and 8) in an 8-month study (N=5 healthy adults; 2 females). During these repeated experiments, CV measures were collected via echocardiography or blood pressure monitor [systolic and diastolic blood pressure (SBP and DBP)] at three assessment time points: 1) after two baseline 8h time in bed (TIB) nights (BL); 2) after a night of total sleep deprivation (TSD); and 3) after two recovery nights of 8-10h TIB (REC). CV measures were also collected once pre and post study. Seated stroke volume (SV), cardiac index (CI), left ventricular ejection time (LVET), SBP and DBP, systemic vascular resistance index (SVRI), and mean arterial pressure (MAP) were collected. Data did not significantly differ between the two studies and therefore were pooled together for analysis (N=11). Repeated measures ANOVA and post-hoc comparisons corrected for multiple testing examined CV measures across all time points.

Results: SV, CI, SVRI, LVET, and SBP, but not DBP or MAP, showed significant changes across time. SV increased with TSD compared to pre-study, BL, and post-study at month 2. CI increased with TSD compared to pre-study, BL, REC, and post-study at month 2. SVRI decreased with TSD compared to pre-study, BL, and REC at month 2 and LVET and SBP increased with TSD compared to BL at month 2. In the 8-month sample subset, SBP increased with TSD compared to BL at month 8.

Conclusion: TSD increased SV, CI, LVET, and SBP, and decreased SVRI, compared to BL at month 2. Notably, TSD also increased SBP compared to BL at month 8, indicating a sustained adverse effect after long-duration repeated exposure to TSD. Overall, SV, CI, SVRI, LVET, and SBP are reliable biomarkers for assessing the harmful long-term cardiovascular effects of TSD.

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0208**BEHAVIORAL PHENOTYPING BASED ON PHYSICAL INACTIVITY CAN PREDICT SLEEP IN FEMALE RATS BEFORE, DURING, AND AFTER SLEEP DISRUPTION.**Kora Kostiew¹, Diya Tuli¹, Jamie Coborn², Christopher Sinton¹, Jennifer Teske¹¹ University of Arizona, ² NovoNordisk

Introduction: Poor sleep affects health. Noise exposure reduces and disrupts sleep in a sex-dependent manner. Non-invasive methods to predict vigilance states have not been tested in female rodents, even though sleep is sex-dependent due to hormonal changes across the estrous cycle. Here, we tested the hypothesis that the duration of physical inactivity (PIA) would 1) change

with the differences in baseline sleep between the light and dark cycle and estrous cycle phases and 2) predict sleep and the change in sleep before, during, and after sleep disruption (SD) independent of circadian phase and estrous cycle.

Methods: Female Sprague-Dawley rats (N=5) implanted with EEG and EMG leads had EEG, EMG, and physical activity measured continuously before, during and after SD caused by noise exposure (i.e., baseline, SD, and recovery for 4d during each study period). Sleep was determined based on two methods [EEG/EMG and a criterion based on the duration of continuous (PIA)]. Reliability was tested with a previously validated criterion (40s). Sensitivity analyses and criterion-related validity analyses for sleep during SD and recovery were conducted across multiple criteria (10-120s). Predictability between the two methods and changes in sleep were calculated.

Results: The 10-30s criteria predicted baseline sleep independent of circadian phase and estrous cycle. The 30s criterion predicted noise-induced SD for the light cycle but no criterion predicted change in sleep for the light cycle. The 10s and 30s criteria predicted noise-induced SD and change in sleep for the dark cycle and 24h period, respectively. Thus, criteria in the 10-30s range predicted recovery sleep and the change in sleep in a manner that was dependent on circadian phase and estrous cycle.

Conclusion: Although a single criterion predicted baseline sleep, sleep during SD and recovery were predicted by different durations of PIA, which were dependent on the circadian phase, phase of the estrous cycle and study period. Hence, this study validates a non-invasive method to measure sleep in female rats and suggests that menstrual phase should be considered when developing non-invasive methods for measuring sleep in women.

Support (if any): US Department of Agriculture

Abstract citation ID: zsad077.0209

0209**CARDIOVASCULAR MEASURES DISPLAY ROBUST PHENOTYPIC STABILITY TO TOTAL SLEEP DEPRIVATION ACROSS LONG-DURATION INTERVALS**Lauren Pasetes¹, Kathleen Rosendahl-Garcia², Namni Goel¹¹ Rush University Medical Center, ² Siemens Healthineers, Inc.

Introduction: For the first time, we determined whether individual differences in cardiovascular (CV) measures are observed in response to total sleep deprivation as well as the stability of such responses across 4-month and 8-month long-duration studies.

Methods: We conducted a five-day experiment twice (at months 2 and 4) in a 4-month study (N=6 healthy adults; 3 females), and a similar five-day experiment three times (at months 2, 4, and 8) in an 8-month study (N=5 healthy adults; 2 females). During these repeated experiments, CV measures were collected via echocardiography or blood pressure monitor [systolic blood pressure (SBP)] at three assessment time points: 1) after two baseline 8h time in bed (TIB) nights (BL); 2) after a night of total sleep deprivation (TSD); and 3) after two recovery nights of 8-10h TIB (REC). Seated SBP, stroke volume (SV), heart rate (HR), cardiac index (CI), left ventricular ejection time (LVET), and systemic vascular resistance index (SVRI) were collected. Data did not significantly differ between the two studies and therefore were pooled together for analysis (N=11). Intraclass correlation coefficients (ICCs) assessed the stability of CV measures during TSD. Spearman's rho assessed the relative rank of individuals' averaged TSD-TSD responses across CV measures.

Results: TSD ICCs across months 2 and 4 were substantial to almost perfect for all CV measures (0.755-0.962). In the 8-month sample subset, TSD ICCs were moderate to almost perfect across 2, 4, and 8 months for all CV measures (0.643-0.944). Individuals also exhibited significant consistency of responses within CV measures: SV was positively correlated with LVEF ($\rho=0.791$, $P=0.004$), HR was negatively correlated with LVEF ($\rho=-0.627$, $P=0.039$) and CI was negatively correlated with SVRI ($\rho=-0.936$, $P<0.001$).

Conclusion: Vulnerability to repeated TSD exposures showed trait-like stability in CV measures across months 2, 4, and 8, with significant consistency of responses within CV measures. For the first time, we demonstrate robust phenotypic stability of cardiovascular measures during total sleep deprivation across 2-month, 4-month and 8-month time points in long-duration studies. Our results herald the use of biomarkers and countermeasures for prediction and mitigation of this critical vulnerability.

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0210

CONSERVATION OF PRIOR SLOW WAVE SLEEP DOES NOT PROVIDE RESILIENCE TO NEUROBEHAVIORAL IMPAIRMENT DURING TOTAL SLEEP DEPRIVATION

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Introduction: Slow wave sleep (SWS) is thought to play a critical, if not unique, role in resilience and recovery of waking function. It has been posited that if SWS is preserved, the impact of sleep restriction on subsequent neurobehavioral functioning should be minimal. In this context, we investigated the effects of a delayed and restricted sleep opportunity on SWS and on neurobehavioral impairment during a subsequent period of total sleep deprivation (TSD).

Methods: N=21 healthy adults (21–38y, 9f) underwent three separate periods of 36h TSD, each preceded by one week of prior sleep extension to 12h time in bed (TIB) per night (PSE condition, twice), or prior sleep restriction to 6h TIB per night (PSR condition, once). The last night of each condition was spent inside the laboratory. TIB for the pre-TSD night was 22:00–10:00 (PSE) or 04:00–10:00 (PSR). During each 36h TSD period, subjects completed a neurobehavioral task battery every 2h including a digit-symbol substitution test (DSST) measuring cognitive throughput and the Karolinska Sleepiness Scale (KSS) measuring subjective sleepiness. Following TSD, subjects had a 12h sleep opportunity (22:00–10:00). Sleep was recorded polysomnographically during both pre- and post-TSD nights.

Results: The pre-TSD night in the PSR condition had less total sleep time, with significant reductions ($p<0.001$) in N1, N2, and REM durations compared to the PSE condition. There were no significant differences between the PSE and PSR conditions in SWS duration ($p=0.40$). Moreover, in the post-TSD night, there were no significant differences ($p>0.1$) between the PSE and PSR conditions in any of the sleep stages, including SWS. Neurobehavioral functioning during TSD exhibited significant effects ($p<0.02$) of prior sleep condition on DSST throughput

and KSS sleepiness, with reduced throughput and increased sleepiness in the PSR condition relative to the PSE condition.

Conclusion: SWS was remarkably conserved in delayed, restricted sleep compared to extended sleep. However, this conservation of SWS did not prevent exacerbation of DSST throughput deficits or KSS sleepiness from prior sleep restriction during subsequent TSD. As such, other aspects of sleep besides SWS are also important in mediating sleep-induced resilience and recovery.

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0211

EXPERIMENTAL SLEEP RESTRICTION, MORAL ABSOLUTISM, AND RELIGIOSITY

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Introduction: Moral absolutism is the notion that “rights” and “wrongs” are independent of situational circumstances, and it is a core philosophy of many religious traditions. We tested whether active church members and Christian pastors showed resiliency to mild sleep restriction when reporting religious beliefs/cognitions, when logging spiritual behaviors, and when judging the deserved-punishments for moral mistakes.

Methods: We recruited 92 adults who identified as active in Christian churches (members and pastors). On a Monday, participants completed baseline religiosity, mood, and cognitive functioning measures and were then randomly assigned to adhere to early (10:30pm) or late (1:30am) bedtimes for four nights, with 7:30am waketimes, while wearing actigraphy and keeping a daily diary of spiritual behaviors. On Friday, participants repeated the baseline assessments, responded whether a series of biblical stories were literal versus figurative, and rated a series of vignettes about moral mistakes that were committed by in-group leaders (pastors) and out-group leaders (imams; vignettes counterbalanced).

Results: The late bedtime condition reduced actigraphy-defined sleep by 85 min/night ($p<.001$). Despite spending more time awake, this sleep restricted group reported engaging in fewer spiritual behaviors during the week (e.g., prayer time; $p<.01$). On Friday, the sleep restricted group had worse mood disturbances ($p<.001$), worse subjective sleepiness ($p<.001$), and altered perceptions of the meaning of the Garden of Eden and Noah’s ark biblical stories ($p<.05$). Fluid intelligence was unaffected ($p=.78$). When evaluating religious leaders who made moral mistakes, the sleep restricted participants were significantly less forgiving ($p<.01$); for example, well-rested participants thought such leaders were still “somewhat likely” to get into Heaven, but sleep-restricted participants rated the leaders as “not very likely” to get into Heaven ($p<.01$). The effects of sleep restriction were most prominent in participants who most frequently attended religious services and when rating out-group religious leaders ($r = -.49$; opposite patterns were noted when participants were well-rested).

Conclusion: In contrast to moral absolutism philosophies, very mild sleep restriction produced significant changes to religious cognitions (story interpretation), spiritual behaviors, and expressions of beliefs (likeliness of getting into Heaven), and expressions of virtues (decreased forgiveness).

Support (if any): URSA Grant and National Science Foundation (1920730, 1943323).

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0212

INSUFFICIENT SLEEP AND BEHAVIORAL HEALTH IN THE MILITARY: A 5-NATION PERSPECTIVE

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Introduction: Insufficient sleep (< 7 hours per night) degrades both health and performance and constitutes a risk to military mission success. Accordingly, militaries across the globe are increasingly focusing on sleep management, including the role that leaders play in fostering and promoting a healthy sleep culture. In the present study, we assessed survey data from the militaries of five nations on: 1) sleep behavior, 2) the relationship between sleep behavior and mental health, and 3) the role leaders play in improving service member sleep. The goal was to determine the extent to which insufficient sleep, its link to behavioral health, and the role of leaders were relevant in militaries across allied English-speaking nations.

Methods: Data from five nations: Australia, Canada, New Zealand, the United Kingdom, and the United States were assessed. Each nation administered a survey to a military sample, including questions on sleep problems (e.g., Insomnia Severity Index) and mental health. In addition, some countries assessed how first-line leaders addressed sleep in their units using items from the sleep leadership scale. Each data collection differed in terms of scope, setting, and objective.

Results: Insufficient sleep (< 7 hours per night) was reported by 34.9%, 67.2% and 95.4% of survey respondents from the New Zealand Defence Force, Canadian Armed Forces, and the US Army, respectively. Those reporting shorter mean sleep durations also reported fewer sleep difficulties, likely reflecting higher sleep pressure from chronic sleep loss. Across all five nations, sleep problems (e.g., difficulty falling asleep) were positively correlated with behavioral health symptoms (e.g., depression and anxiety symptoms). Importantly, leader engagement in promoting healthy sleep was positively correlated with sleep duration and negatively correlated with sleep problems and behavioral health symptoms.

Conclusion: Insufficient sleep is pervasive in the militaries of the nations included in the present study – a finding that has serious implications for the behavioral health and resilience of service members, and more broadly for the overall effectiveness of these military forces. Across nations, militaries should attend to these risks and examine ways that first-line leaders can promote healthy sleep in their service members.

Support (if any): Department of Defense Military Operational Medicine Research Program

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0213

SLEEP AND WELL-BEING OF CULINARY SPECIALISTS ON UNITED STATES NAVY SHIPS

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Introduction: In the US Navy, “galley workers” are those sailors involved in cooking and preparing meals and maintaining the overall cleanliness and hygiene of the galley spaces and messdecks.

These sailors begin their workday in the ship’s kitchen in the early morning, working until late in the evening, typically sleeping at night. The purpose of the current study was to assess the fatigue levels, work/rest patterns, health-related behaviors, and well-being of galley workers on US Navy ships while underway.

Methods: In this longitudinal field assessment, 80 fit-for-duty US Navy galley workers performed their normal duties on 11 surface ships. Participants wore actigraphs, and completed activity logs and questionnaires to include four standardized tools (Pittsburgh Sleep Quality Index – PSQI; Epworth Sleepiness Scale – ESS; Insomnia Severity Index – ISI; Profile of Mood States – POMS).

Results: Galley workers had a median age of 25 (IQR=11.8) years and most of them were male (68, 85.0%). Most galley workers reported drinking caffeinated beverages (60, 80.0%), with nicotine or tobacco products used by 22 (29.3%) participants. In terms of working out, 46 (61.3%) reported having an exercise routine. The typical schedule of the galley workers included sleeping at night with work hours extending from around 6:00 AM till 8:00 PM. Specifically, they slept on average 6.57±0.85 hours/day (~29% slept < 6 hours/day) and worked 12.8±2.43 hours/day (25% worked >14.5 hours/day). Approximately 84% were classified as poor sleepers, ~57% had excessive daytime sleepiness, and ~38% had elevated insomnia symptoms. Compared to adult norms for the POMS total and subscales scores, the mood of galley workers was worse in terms of total mood disturbance (84.1%), tension-anxiety (71.4%), anger-hostility (79.4%), vigor-activity (77.8%), fatigue (68.3%), and confusion-bewilderment (73.0%).

Conclusion: Galley workers on USN ships are chronically sleep-deprived and work long hours. To ameliorate the detrimental effects of these issues on sailor well-being, leaders should consider adopting strategies to improve sailor well-being. For example, appropriately timed short naps during the day, use of caffeine, and exposure to bright light may be viable methods to incorporate into the daily schedule of galley workers to alleviate the effects of their arduous work schedules.

Support (if any):

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0214

SLEEP DURATION MODERATES THE LINK BETWEEN YOUTH IMPULSIVITY AND MATURE-RATED MEDIA USAGE ONE YEAR LATER

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Introduction: Adolescents who evince higher levels of impulsive traits are more susceptible to early use of mature-rated gaming and watching R-rated movies. This is a major public health concern because exposure to mature-rated media in youth is associated with decreased empathy and aggressive behaviors later in life. However, not all youth with higher impulsive traits will be engaged in those risky media activities. Sleep is a critical bioregulatory behavior during adolescence, and shorter sleep duration is associated with decreased emotional regulation and attention span. Yet, few studies examined whether sleep duration moderates the association between impulsivity and risky media usage.

Methods: The current study examines the associations between sleep, impulsivity, and mature-rated video gaming and movie

watching using longitudinal data of 2,757 early adolescents (49.3% female, Mage at 3-year follow-up=12.9 years, SD=0.65), collected through the Adolescent Brain Cognitive Development Study® (2021, release 4.0). The participants' weighted weekly sleep duration was measured via Fitbit watches for at least seven days at 2-year follow-up. Participants completed questionnaires about impulsivity via UPPS-P Impulsive Behavior Scale at 2-year follow-up and R-rated movie watching and mature video gaming at 2- and 3-year follow-up. Structural equation modeling was conducted in Mplus 8.1 to test impulsivity and sleep duration's direct and interaction effects on mature media use while controlling for bedtime screen use, parental monitoring, and demographic covariates.

Results: Higher impulsivity was predictive for more R-rated movie watching ($\beta=0.09$, $p<.001$) one year later. Shorter sleep duration was predictive for more mature video gaming ($\beta=-0.05$, $p=.006$) and R-rated movie watching ($\beta=-0.07$, $p<.001$) one year later. Sleep duration moderates the association between impulsivity and R-rated movie watching ($\beta=-0.04$, $p=.03$). Among youth with high impulsivity, shorter sleep duration was associated with an increased risk for R-rated movie watching.

Conclusion: Impulsivity is associated with R-rated movie watching, and short sleep duration (objectively measured with Fitbit) in early adolescence partially moderates the association between impulsivity and mature media usage. Sleep duration may be a modifiable factor for prevention and intervention efforts, especially in adolescents at higher risk for excessive mature-rated media usage.

Support (if any): National Institutes of Health

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0215

TARGETING THE KNOWLEDGE-BEHAVIOR GAP IN SLEEP: THE IMPACT OF AUGMENTING SLEEP EDUCATION WITH IMPLEMENTATION INTENTIONS

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Introduction: Sleep education programs are increasingly utilized in high schools and universities to address late bedtimes and poor sleep quality in students. While these programs successfully improve sleep knowledge, they often do not change sleep behaviors (e.g., bedtimes), especially during academically demanding/stressful periods. A potential method for bridging the knowledge-behavior gap in sleep is to augment sleep education with implementation intention formation (Education+II), an established goal-fulfillment strategy. We tested this intervention in a highly demanding context: students enrolled in organic chemistry classes.

Methods: Undergraduate students (N=101) completed baseline questionnaires and actigraphy monitoring before completing a standardized sleep education program (Sleep 101). Afterward, participants were randomly assigned to an Education-Only condition or an Education+II condition. In the Education+II condition, using standardized if-then verbalization and visualization techniques, participants formed specific plans to go to bed earlier for the next five school nights. Participants were sent text reminders to implement their specific plans; nightly texts were also sent to Education-Only participants, but they were asked to reply with an interesting fact about sleep they learned during the education program. Participants completed questionnaires at the end of the intervention period as well as during 1-month and 7-month follow-up periods.

Results: There were significant time-dependent improvements in total sleep time, global sleep quality, mood, and perceived stress across groups, suggesting benefits of receiving sleep education. Participants in the Education+II condition demonstrated earlier bedtimes than those in the Education-Only condition during the intervention phase (both actigraphy and self-report) and at least one month later. Forming an implementation intention did not improve organic chemistry grades on a group-level, but grades in non-chemistry courses were higher in Education+II participants who maintained earlier bedtimes (a correlational pattern specific to this condition).

Conclusion: Augmenting sleep education with implementation intentions successfully advanced bedtimes during a rigorous organic chemistry course. Implementation intentions are a no-cost technique that is easy to build into sleep education programs. Doing so will encourage individuals to turn their general intentions to get better sleep into actualizable steps that facilitate behavioral change.

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0216

THE RELATIONSHIP BETWEEN WORK AND SLEEP IN THE NAVAL OPERATIONAL ENVIRONMENT

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Introduction: Several studies conducted by the Naval Postgraduate School Crew Endurance Team have shown that a sailor's life at sea is characterized by limited opportunities to sleep and long work hours. In this environment, which is saturated with work duties, time is a rare commodity. This study assesses how work hours affect sleep duration. The information presented herein is a subset of the measures taken from multiple field assessments on sailors aboard nine different USN ships.

Methods: Longitudinal (average = 11 days; range = 7 to 18 days), prospective, naturalistic observations were made of sailors (N=675; 18-59 years of age, 79.3% males, 85.3% enlisted) while performing their normal underway duties on nine US Navy surface ships. Activity logs were used to assess work hours, messing (meals), and personal time. Sleep was objectively assessed by actigraphs.

Results: The average sailor's workday was 11.6 hours (s.d.=2.48). Sailors slept on average 6.53 hours/day (s.d.=0.97), a median 1.34 hours/day (IQR=0.88) were spent messing/eating and a median 3.25 hours/day (IQR=2.50) were reported for personal time. Work hours were associated with daily sleep duration ($F(1,602)=105$, $p < 0.001$; $R^2=0.148$), personal time ($F(1,673)=1539$, $p < 0.001$; $R^2=0.696$), and messing time ($F(1,673)=32.0$, $p < 0.001$; $R^2=0.044$). Within the range of our data, every extra hour of work was associated with an average of ~9 minutes less sleep, ~41 minutes less personal time, and ~3 minutes less time at meals. The association between work hours and sleep duration was evident (all $p < 0.001$) even after adjusting for confounding factors, i.e., watchstanding status (watchstander, non-watchstander), type of watch schedule (fixed, rotating), rank group (officer, enlisted), and detailed rank group (E1-E3, E4-E6, E7-E9, O1-O3, O4-O6).

Conclusion: The naval operational environment is dominated by long work hours that, in turn, lead to sleep deprivation. The competing relation between work and sleep, however, is ameliorated by the existence of personal time (i.e., spare time in which

sailors do not work). More research should be focused on spare time and its importance for sailor wellbeing while underway.

Support (if any):

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0217

TRAIT-LIKE STABILITY OF CARDIOVASCULAR MEASURES ACROSS LONG-DURATION INTERVALS AFTER BASELINE AND RECOVERY SLEEP PHASES

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Introduction: We determined for the first time whether individual differences in cardiovascular (CV) measures are observed after repeated baseline and recovery sleep (prior to and after exposure to total sleep deprivation) as well as the stability of such responses across 4-month and 8-month long-duration studies.

Methods: We conducted a five-day experiment twice (at months 2 and 4) in a 4-month study (N=6 healthy adults; 3 females), and a similar five-day experiment three times (at months 2, 4, and 8) in an 8-month study (N=5 healthy adults; 2 females). During these repeated experiments, CV measures were collected via echocardiography at three assessment time points: 1) after two baseline 8h time in bed (TIB) nights (BL); 2) after a night of total sleep deprivation (TSD); and 3) after two recovery nights of 8-10h TIB (REC). Seated stroke volume (SV), heart rate (HR), cardiac index (CI), left ventricular ejection time (LVET), and systemic vascular resistance index (SVRI) were collected. Data did not significantly differ between the two studies and therefore were pooled together for analysis (N=11). Intraclass correlation coefficients (ICCs) assessed the stability of CV measures after BL and REC. Spearman's rho assessed the relative rank of individuals' averaged BL and REC responses across CV measures.

Results: BL ICCs (0.821-0.944) and REC ICCs (0.806-0.869) comparing months 2 and 4 for all CV measures were almost perfect. The ICCs comparing BL vs. REC measures at month 2 (0.816-0.969) and at month 4 (0.816-0.927) for all CV measures were similarly almost perfect. In the 8-month sample subset, BL ICCs (0.693-0.939) and REC ICCs (0.770-0.960) comparing months 2, 4 and 8 for all CV measures were substantial to almost perfect. The ICCs comparing BL vs. REC measures at month 8 for all CV measures were fair to almost perfect (0.314-0.960). Individuals also exhibited significant consistency of responses within CV measures across 2 months and 4 months during BL and REC.

Conclusion: This is the first demonstration of remarkable robust phenotypic stability of a number of cardiovascular measures across repeated baseline and recovery sleep and across various CV measures in long-duration studies.

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0218

CHANGES IN SLEEP ARCHITECTURE AND TOPOGRAPHY OF SLEEP EEG SLOW WAVE ACTIVITY FOLLOWING ACUTE WAKE EXTENSION IN EARLY ADOLESCENCE

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Introduction: A progression of peak sleep EEG slow wave activity (SWA; EEG power 0.5-4Hz) from posterior to anterior expression reflects brain development. Further, increased EEG SWA after extended wakefulness is a marker of sleep pressure. However, it is unclear whether recovery sleep SWA in later youth is expressed in a similar scalp topography as typical sleep. Using experimental wake-extension, we investigated homeostatic changes in sleep architecture and SWA topography in early adolescence.

Methods: Twenty-two young adolescents (M±SD: 12.03±1.14y, 12F) participated in two consecutive laboratory stays after at least a week of at-home actigraphy-monitored stabilization (9.5h in bed). A baseline night (BSL; 9.5h 21:00-06:30) was followed by wake-extension (WE) to 02:30 and a 4h recovery sleep opportunity (RS; 02:30-06:30), each monitored by polysomnography including a 25-channel EEG array. The current analyses examined R&K sleep architecture at BSL and RS. SWA in RS was compared to the first 4h of BSL in two ways: (1) absolute NREM power (μV2); (2) an index (TI) of the topographical distribution of midline SWA (FPz-AFz-Fz-FCz-Cz-CPz-Pz-POz-Oz) providing a score of 1 to 9 indicating frontal to occipital peak distribution.

Results: WE significantly altered RS sleep architecture, including an increase in slow-wave sleep (%TST) versus BSL (M±SD BSL: 26.76±5.69%, RS: 51.65±7.83%, t(21)=-17.09, p<.001, d=-3.65). SWA was also significantly greater in RS (channel-averaged SWA BSL: 11883.50±5142.17 μV2, RS: 18955.82±7451.20 μV2, t(21)=-8.67, p<.001) with 22/25 individual electrodes meeting Bonferroni-corrected significance (ps<.001). Finally, we observed a small frontal shift (t(21)=2.39, p=.027, d=.51) of maximal SWA in RS (TI: 4.46±2.58; i.e., FCz/Cz) compared to BSL (5.32±2.78, i.e., Cz/CPz).

Conclusion: These data indicate robust sleep homeostasis in young adolescents after wake extension, expressed as increased SWA across the scalp. The findings also add to existing literature by indicating that SWA topography may also be sensitive to homeostatic challenge. Specifically, a baseline centroparietal locus of maximal SWA typical to this age became more fronto-central in recovery sleep. This anterior shift may reflect a homeostatic need over developmentally sensitive prefrontal cortex. Next steps will assess how individual responses may reflect a child's neurodevelopment (e.g., inattention symptoms) or manifested behavior after wake extension and recovery sleep.

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0219

EXPERIMENTAL STUDY ON THERMAL COMFORT AND SLEEP QUALITY OF SLEEPING PEOPLE IN OVERHEATED BEDROOM CONDITIONS IN THE UK

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Introduction: Thermal comfort and sleep quality are important factors in human health and well-being and can be influenced

by various environmental factors such as ambient temperature, humidity, and airflow. The microclimate within a bed, or the local climate immediately surrounding a person's body while they sleep, can also have a significant impact on thermal comfort and sleep quality.

Methods: In this paper, we investigate the relationship between bed microclimate and thermal comfort and sleep quality in overheated bedroom conditions that are prevalent during heatwaves in the United Kingdom. Participants were screened using the Sleep Disorder Symptoms Checklist (SDS-CL)-25 and health questionnaire. 10 healthy participants were recruited in a 3-night sleep monitoring in the bedrooms of student accommodation hall at Loughborough University campus in the summer of 2022. Baseline sleep quality (in-home) was objectively and subjectively collected for all the participants before the onset of the 3-night sleep monitoring period. Subjective response (self-rating) of sleep quality, sleep satisfaction, thermal sensation, and thermal satisfaction of the room and bed microclimate was collected using Consensus Sleep Diary and survey questionnaires, twice each night (before sleeping) and once in the morning (after waking up). Data on sleeping environment conditions (both room thermal environment and bed microclimate) were collected every night throughout the experiment period. Sleep quality of participants was objectively measured using actigraphy method and mean skin temperature was measured using wireless sensors at ten locations on the body.

Results: Overall, sleep quality in the overheated bedroom conditions was poorer compared to the baseline sleep quality. We found that the sleep efficiency reduced, and the self-rated sleep experience was significantly poorer, compared to the baseline. Impact of room thermal conditions on sleep latency was examined, which was found to be increased significantly in the overheated conditions compared to baseline (at home). The results also highlight the statistical significance between sleep quality, skin temperature, and bed temperature.

Conclusion: This study highlights the impact of overheated bedroom conditions (room environment and bed microclimate) on both thermal comfort and sleep quality, and the importance of considering the bed microclimate in the design and management of sleeping environments.

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0220

SLEEP DEPRIVATION ENHANCES THETA FLUCTUATIONS IN TIME PERCEPTION

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Introduction: Sleep deprivation can impair time perception. In a sleep-deprived state, time tends to be overestimated. In addition, sleep deprivation can affect circadian fluctuations in time perception. Time perception may also fluctuate at rhythms other than circadian rhythms, such as theta frequency. Previous studies have shown that perceived time can fluctuate at theta frequencies and that such fluctuations are a function of the cue-to-target interval for the response. However, whether sleep deprivation affects theta fluctuations in time perception is unknown.

Methods: In this study, we compared a sleep deprivation condition with a normal sleep condition that served as an experimental control. In both conditions, participants (N=24, 13 females, mean age 25.6±3.5 years) were asked to complete a task to generate 3 seconds of time by pressing a key before and after sleep or sleep deprivation

time (23:00 to 8:00). The interval between the cue (cueing that a response signal will appear) and the response signal (requiring 3 seconds to be generated as soon as possible) was designed to range from 0.25 to 1.05 seconds in steps of 1/30th of a second.

Results: As a result, similar to previous studies, an overestimation of time was observed in the case of sleep deprivation. In addition, stronger fluctuations in time perception were found at low theta frequencies (4.4 to 4.8 Hz) in the case of sleep deprivation.

Conclusion: This study suggests that cognitive abilities such as time perception fluctuate at different rhythms, and sleep deprivation may affect these fluctuations. These fluctuations may be associated with instability of brain states and functions (e.g., attention) due to sleep deprivation. Further studies are needed to elucidate the neurophysiological mechanisms.

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0221

TIME TO WAKE UP! ADOLESCENTS WOKEN UP BY AN ALARM OR FAMILY MEMBER GET SHORT SLEEP ON SCHOOLDAYS AND WEEKENDS/HOLIDAYS

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Introduction: Many adolescents get insufficient sleep on schooldays because they need to wake up early. It is often assumed that students can sleep in longer on non-schooldays (weekends and holiday periods) to recover their sleep debt. However, few studies have explored the degree to which adolescents are given the freedom to extend their nocturnal sleep. Here, (1) we investigated how often adolescents are awoken by an alarm or family member on schooldays and non-schooldays, and (2) we tested whether this results in shorter sleep even on non-school days.

Methods: Adolescents aged 13-18 years (n=66; 10 schools in Singapore) wore an actigraphy watch (Actigraph wGT3X-BT) and completed daily diaries for 7 days during their school and holiday periods. Each morning, students indicated their reason for having woken. Actigraphy-derived sleep parameters included sleep onset, sleep offset, and the nocturnal sleep period. Simple effect sizes (e.g., mean difference in sleep period) were calculated for schooldays versus non-schooldays, and for days waking up to an alarm or family member versus other reasons.

Results: Adolescents' nocturnal sleep was about 1.7 hours shorter on schooldays (mean=6.50h, 95% CI=6.24h-6.75h) compared with non-schooldays (mean=8.17h, 95% CI=7.89h to 8.45h) because they woke up much earlier. Students were awoken by an alarm or family member on 78% of schooldays, and this was associated with shorter nocturnal sleep compared with waking up for other reasons (mean difference in sleep period=-1.16h, 95% CI=-1.59h to -0.80h). By comparison, adolescents were awoken by an alarm or family member on 41% of non-schooldays. In such instances, students also obtained shorter sleep by about an hour (mean difference in sleep period=-1.21h, 95% CI=-1.46h to -0.94h) and slept less than the recommended amount for their age group (mean sleep period=7.38h, 95% CI=7.18h to 7.59h).

Conclusion: Adolescents' nocturnal sleep was frequently interrupted by an alarm or family member on both schooldays and non-schooldays. Chronic sleep restriction extends beyond schooldays if adolescents are not allowed to wake up naturally

on their ‘free days’. This may have deleterious effects on students’ performance and wellbeing.

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0222

UNIVERSITY STUDENTS PROCRASTINATE GOING TO BED FOR MULTIPLE REASONS THAT RESULT IN SHORTER SLEEP ON SCHOOL AND NON-SCHOOL NIGHTS

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Introduction: Bedtime procrastination occurs when individuals go to bed later than they intended despite knowing that there may be negative consequences. The prevalence, drivers, and consequences of bedtime procrastination on daily sleep behavior are poorly understood. In university students, (1) we measured the frequencies and reasons for going to bed later than intended, and (2) we tested the hypothesis that bedtime procrastination results in shorter sleep on school nights but not non-school nights.

Methods: University students living in a residential college (n=109) completed daily sleep diaries for 2 weeks during their school semester. Each morning, students indicated if they went to bed later than they intended and the associated reasons. Sleep parameters included bedtime, wake-up time, and nocturnal time in bed for sleep. Simple effect sizes were used to compare mean differences in sleep behavior on nights with versus without bedtime procrastination.

Results: Students went to bed later than they intended on approximately half of all nights, irrespective of whether they had school the next day (school nights, 56.6%; non-school nights, 51.6%). On school and non-school nights with bedtime procrastination, time in bed was shorter by about 45 min (school nights: mean difference=-0.74h, 95% CI=-0.97h to -0.53h; non-school nights: mean difference=-0.79h, 95% CI=-1.01h to -0.58h). The most common reason for bedtime procrastination was “lost track of time” (34.9%), which was reported nearly twice as often compared with “wanted some me time” (19.5%), “wasn’t tired yet” (16.7%), “engaging in social leisure activities in person” (15.2%), and “engaging in social leisure activities online” (13.6%). The largest decrease in time in bed was observed when bedtime procrastination occurred due to in-person social activities (mean difference=-1.23h, 95% CI=-1.49h to -0.97h).

Conclusion: University students living in a residential college frequently engaged in bedtime procrastination on school and non-school nights, resulting in shorter nocturnal sleep opportunities. Losing track of time was the most common reason, suggesting that interventions for improving sleep in these students should emphasize self-regulation and time management skills. Our findings also suggest a strong social component of bedtime procrastination.

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0223

ASSOCIATIONS OF PAIN FREQUENCY AND SEVERITY WITH EXCESSIVE AND INSUFFICIENT SLEEP DURATION IN U.S. ADULTS

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Introduction: Pain and inadequate sleep duration are prevalent among adults in the United States. Both pain and inadequate sleep have been related to poorer quality of life and adverse health outcomes. However, the relationships of pain frequency and severity, modeled as predictors, to sleep duration have rarely been studied at the population level, particularly in the U.S. We aimed to investigate the relationships of both pain frequency and pain severity to sleep duration in a representative, population-based U.S. sample.

Methods: 2018 National Health Interview Survey data were analyzed. Self-reported sleep duration (on average) was categorized as short (6 hours or less), normal (7-9 hours), and long (10+ hours). Self-reported pain frequency (in the last three months) and pain severity (most recent event) were each categorized as “higher” and “lower or no”. Potential confounders/adjustment variables examined included age, sex, weight, chronic health conditions, race/ethnicity, depression, anxiety, and sleep medication use. For adjusted analyses, a multinomial logistic regression was fitted using stepwise selection using a sample of 10,173 U.S. adults. We estimated odds ratios (OR) and 95 percent (%) confidence intervals (CI) for three categories of sleep duration with regard to both pain frequency and severity in an adjusted multinomial model.

Results: In a multinomial model adjusted for age, anxiety, depression, and race/ethnicity, higher pain frequency, versus lower/no, was found to be associated with increased odds of short (OR=1.52, 95% CI, 1.38-1.66) and long (OR=1.85, 95% CI, 1.50-2.28) sleep duration versus normal sleep. In the same adjusted model, higher pain severity, versus lower/none, was found to be associated with an increased odds of short (OR=1.49, 95% CI, 1.33-1.68) and long (OR=1.77, 95% CI, 1.40-2.22) sleep duration versus normal sleep duration.

Conclusion: Higher pain frequency and higher pain severity, versus low or none, were both associated with an increased odds of insufficient (by 1.5-fold) and excessive (by 1.9 and 1.8-fold, respectively) sleep duration (vs. normal) in a large population-based U.S. sample. Results suggest that the prevention of pain, both its frequency and severity, should be considered to improve unhealthy sleep duration among US adults.

Support (if any): None

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0224

CHRONIC CHANGE IN SLEEP OSCILLATION EXPRESSION IN OLDER ADULTS WITH INSOMNIA WITH ZOLPIDEM OR LEMBorexant AND ITS EFFECT ON MEMORY

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Introduction: Aging is accompanied by increased insomnia and memory decline. Enhancing GABAergic and antagonizing orexinergic function are both ways to treat insomnia, but how these mechanisms impact sleep oscillations, and consequently memory, among older adults with insomnia is unknown. Thus, chronic effects of zolpidem and lemborexant on quantitative sleep electroencephalography (EEG) and quality of memory among older adults with insomnia were evaluated.

Methods: 116 older adults (71.01±4.81y, 78.67% female) with insomnia (Insomnia Severity Index 18.73±3.13) completed a phase 3 study (E2006-G000-304; NCT02783729) with placebo

(n=29), zolpidem-extended-release (6.25mg,n=26;ZOL), and lemborexant (5mg,n=29[LEM5]; 10mg,n=32[LEM10]) using polysomnography before (at baseline) and 29-30 days after chronic treatment. Spectral analysis was performed on artifact-free EEG data during NREM sleep. Changes in relative power within canonical frequency bands (i.e., slow-oscillation[0.5-1Hz], delta[1-4.5Hz], theta[4.5-7.5Hz], alpha[7.5-11Hz], slow-sigma[11-13Hz], fast-sigma[13-16Hz], beta[16-28Hz] and gamma[28-35Hz]) from baseline were compared between groups at averaged frontal electrodes at each visit. Working (WM) and episodic memory (EM) were measured at waketime using ANOVA models and Pearson correlations.

Results: A significant main effect of intervention on frequency bands delta ($p=0.02$), slow-sigma ($p<.001$), and fast-sigma ($p<.001$) was found, with greater chronic suppression in power for ZOL compared to PBO for delta ($p=0.002$). Compared to PBO, ZOL showed greater increase in power for slow-sigma ($p<.001$), fast-sigma ($p<.001$) and beta ($p=.03$), and was also associated with greater increases in power compared to LEM5 for slow-sigma ($p<.001$) and fast-sigma ($p=.006$), and compared to LEM10 for alpha ($p=.04$), slow-sigma ($p<0.00$), and fast-sigma ($p<.001$). LEM5 showed greater beta ($p=.05$) than PBO. WM was significantly higher (better) for LEM5 compared to PBO ($p=0.04$), while EM was higher for PBO compared to ZOL ($p=0.01$). Increase in beta with ZOL was related to decreased change-from-baseline-WM ($r=-0.43$, $p=.03$); increases in theta and alpha with LEM5 were related to decreased change-from-baseline-EM [$r=-0.38$, $p=0.04$; $r=-0.39$, $p=0.03$]; and increase in delta with LEM10 was related to increased change-from-baseline-EM ($r=0.43$, $p=0.02$).

Conclusion: In older adults with insomnia disorder, chronic treatment with lemborexant and zolpidem had distinct effects on sleep oscillation expression and between power and memory. Functional consequences of these differential effects on sleep-oscillation expression and memory in insomnia patients should be further considered.

Support (if any): Eisai

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0225

EFFECT OF THERMONEUTRAL TEMPERATURE EXPOSURE IN THE APP/PS1 KNOCK-IN MOUSE MODEL OF ALZHEIMER'S DISEASE

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Introduction: There is growing evidence that disordered sleep in Alzheimer's disease (AD) may accelerate neuropathology, thus promoting a vicious cycle. In a previous study, we found that improving sleep through thermoneutral ambient temperature exposure may slow disease progression in 3xTg-AD mice. However, the confounding effects of temperature on metabolism in addition to sleep remained an open question.

Methods: To test whether the effect of thermoneutral warming on amyloid pathology is mediated by sleep changes rather than other non-specific physiologic effects of temperature, we conducted a new study on APP/PS1 knock-in (KI) mice. First, 6-m.o. male APP/PS1-KI mice were instrumented for EEG/EMG sleep analysis. After a week-long baseline recording, we split the mice into 4 separate groups: 1. SE (n=8), which were exposed to 30°C

thermoneutral ambient temperature during the 12-hour light period; 2. SE-SD (n=9), which received sleep disruption through mild intermittent cage vibration alongside thermoneutral temperature exposure; 3. SD (n=8), which received sleep disruption at room temperature (22°C); and 4. CTRL (n=8), which were undisturbed and at room temperature. This design aims to decouple the sleep-enhancing effect of thermoneutral exposure from other non-specific effects. After four weeks of treatment, the animals were euthanized and the brains dissected to assay A β levels by ELISA. Vigilance states, i.e., Wake, REM, NREM, and slow wave sleep (SWS) within NREM – were scored in 4-second epochs from the EEG/EMG recordings and sleep metrics computed.

Results: Initial analysis of sleep revealed some SE-induced increases in SWS similar to our findings in 3xTg-AD mice. Sleep disruption reduces SWS even when thermoneutral warming occurs. Biochemical assays are in progress to reveal the treatment effects on A β levels in the brain.

Conclusion: Sleep disruption through vibration seems to be an effective way to negate the sleep-specific effect of thermoneutral temperature exposure. Incorporation of the biochemical assay data will help uncover the correlation between SWS and AD progression.

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0226

EFFECT OF WAKE EXTENSION AND SHORT RECOVERY SLEEP ON OBJECTIVE VIGILANCE AND SUBJECTIVE SLEEPINESS IN YOUNG ADOLESCENTS

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Introduction: Adolescents routinely experience insufficient sleep. Compared to adults, less is known regarding how wake extension and recovery sleep impact objective and subjective indexes of vigilance in youth. Here we explore these questions using acute wake extension.

Methods: Twenty-two 10–13-year-old children (12.03 $\pm$ 1.14 years, 12F) completed a week of actigraphy-monitored at-home sleep stabilization (9.5h TIB). Participants then slept in the laboratory with polysomnography for a baseline (BSL) opportunity of 9.5h (21:00-06:30) and returned the subsequent evening for wake extension (WE) to 02:30 and a 4h recovery sleep opportunity (02:30-06:30). Participants completed performance testing batteries including a 5-minute tablet-based visual adaptation of the psychomotor vigilance task (PVT; BrainBaseline) and introspective ratings at 20:00 and 07:30, as well as at three additional times during WE: 22:00, 00:00, and 01:30. The current analyses focused on PVT reciprocal reaction time (RRT: 1/RT) and the Stanford Sleepiness Scale (SSS) ratings.

Results: One-way ANOVA across WE (20:00, 22:00, 00:00, 01:30) showed a main effect of time for slower reaction times as participants remained awake ($m\pm sd$ [1/s] 20:00: 2.01 $\pm$ 0.32; 22:00: 1.84 $\pm$ 0.33; 00:00: 1.79 $\pm$ 0.29; 01:30: 1.71 $\pm$ 0.34; $F(3,63)=13.78$, $p<.05$, $\eta^2=.40$). After recovery sleep, RRTs at 07:30 (1.69 $\pm$ 0.31) were slower than those at 07:30 after baseline sleep (1.95 $\pm$ 0.36)

($t(21)=5.46$, $p<.001$) and did not differ from 01:30 during WE ($t(21)=0.64$, $p=0.53$), indicating persistent impairment after recovery sleep. A main effect of time during WE was also seen for the SSS (20:00: 1.77 ± 0.69 ; 22:00: 3.36 ± 1.71 ; 00:00: 4.14 ± 1.21 ; 01:30: 5.68 ± 1.25 ; $F(3,63)=56.80$, $p<.001$, $\eta^2=.73$). Morning SSS scores were higher (sleepier) on WE (2.24 ± 1.30) than BSL (1.71 ± 0.90) ($t(20)=2.45$, $p=.024$). However, unlike RRTs, morning SSS scores were also significantly lower (less sleepy) at 07:30 following recovery sleep compared to 01:30 during WE ($t(21)=9.80$, $p<.001$).

Conclusion: Vigilance performance and sleepiness after 13.5 until 19 h awake worsened and PVT performance did not improve after 4h recovery sleep; however, perceived sleepiness after 4h recovery sleep decreased. This incongruent performance and perception confirms the vulnerability of youth to even partial sleep loss. Our next analyses will consider inattention phenotypes and recovery sleep physiology as potential moderators of these effects.

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0227

IMPACT OF 5-NIGHT SLEEP RESTRICTION ON ACTIGRAPHY-ESTIMATED SLEEP IN YOUNG ADOLESCENTS: PRELIMINARY ASSOCIATIONS WITH ADHD TRAITS

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Introduction: Prior research suggests that children with attention-deficit/hyperactivity-disorder (ADHD) may experience disrupted sleep. In typically developing children, short-term sleep restriction increases sleep pressure and efficiency; however, whether a similar homeostatic response occurs in children with ADHD is unknown. Here we explore the effects of 5 nights of experimental sleep restriction on actigraphy-estimated sleep of children with and without high ADHD characteristics.

Methods: Nineteen young adolescents (Mage=12.24yr, range 10.17-13.88yr; 10F/9M) participated in an at-home crossover protocol. After ≥ 5 nights of stabilization (10hr time-in-bed[TIB] set to habitual risetimes), participants had five nights of sleep optimization (SO; same stabilization schedule) or restriction (SR; 7.5hr TIB, sleep opportunity reduced by delaying bedtime and advancing risetime equally), a 2-3 night restabilization, and then the reverse schedule. Sleep was assessed via wrist-worn actigraphy (AMI Micro Motionlogger), sleep diaries, and twice-daily phone calls ensuring schedule adherence. Primary sleep variables included: total sleep time (TST; min), sleep period time (SPT; min), and sleep efficiency (TST/SPT*100). Children were grouped by parent-rated Conners 3 ADHD-Probability-Index: $< 50\%$ (low-ADHD; $n=10$, 8F) or $\geq 50\%$ (high-ADHD; $n=9$, 2F).

Results: Mixed-effects ANOVAs evaluating condition (SO vs. SR) and group (low- vs. high-ADHD) on schedule adherence indicated significant effects of condition; that is, SR reduced both SPT ($M\pm SD$ SO=9.08[0.54]hr, SR=7.10[0.57]hr; $F(1,17)=479.75$, $p<.001$, $\eta^2=.97$) and TST ($M\pm SD$

SO=7.92[0.97]hr, SR=6.38[0.86]hr; $F(1,17)=302.13$, $p<.001$, $\eta^2=.95$). No group or group-by-condition effects were significant (all $ps>.21$). For sleep efficiency, a group-x-condition interaction ($F(1,17)=8.29$, $p=.01$, $\eta^2=.33$) revealed that SR significantly increased sleep efficiency in low-ADHD children ($M\pm SD$ SO=85.08[9.95]%, SR=89.74[7.66]%, Bonferroni- $p<.001$) but not in high-ADHD children ($M\pm SD$ SO=90.67[3.74]%, SR=91.21[3.19]%, Bonferroni- $p=.61$). Other between-group effects were not significant (all $ps>.12$).

Conclusion: These preliminary data indicate that our sleep restriction protocol successfully reduces sleep opportunity and sleep duration in peripubertal children, including those with high ADHD traits. Notably, sleep restriction improved sleep efficiency in low-ADHD children, whereas sleep efficiency was high and unchanging in our high-ADHD group. It is possible that high-ADHD children maintained higher sleep pressure even after stabilization. While data collection (matching groups on sex and age) continues, we are examining waking EEG markers to explore this possibility.

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0228

INVESTIGATING APPLICATION OF PHASE CONTRAST MRI TO STUDY CSF MOVEMENT IN AGING AND SLEEP DEPRIVATION.

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Introduction: The glymphatic system facilitates solute transport through the exchange of cerebral spinal fluid (CSF) and interstitial fluids using a brain-wide system of perivascular spaces. Such exchange is primarily active during sleep. Aging and sleep disruptions have been shown to decrease glymphatic clearance and increase risk of cognitive impairment. Here, we used phase contrast MRI (PC MRI) to measure CSF egress from the Aqueduct of Sylvius (AoS) as a marker of CSF circulation in the setting of sleep deprivation and aging.

Methods: Under approved IRB protocols six young adults (22 ± 3 yo, 4F) underwent a night of full sleep and a night of sleep deprivation in a 3T Philips Ingenia Elition scanner with a 32-channel head coil. Additionally, six older adults (66 ± 3 yo, 2F) were scanned using identical MRI protocol but only after full sleep. The PC MRI was a single slice acquisitions with 14 samples within a cardiac cycle. The slice was perpendicular to the AoS and care was taken to avoid any phase wrapping. All individuals also completed the General Practitioner's assessment of cognition (GPCOG) in the morning prior to their scan. CSF velocity in cm/s was calculated from the phase data. Heart rate (HR) was recorded during the scan using a pulse-oximeter.

Results: CSF velocity was numerically lower after sleep deprivation (2.6 ± 2.1 cm/s) than after a night of full sleep (3.1 ± 2.0 cm/s) in young adults, but the difference was not significant. CSF velocity in the older adults was lower (2.0 ± 0.5 cm/s, marginally significant at $p = 0.10$) than in young adults. HR in older adults (59 ± 6) was significantly lower than the young adults under both conditions (full sleep: 68 ± 4 , sleep deprivation: 66 ± 11) and, across all participants, HR was weakly correlated ($r=-0.35$) with CSF velocity. GPCOG was not significantly different across conditions or groups.

Conclusion: Although only marginally significant, CSF velocity in the AoS, measured by PC MRI is sensitive to HR variations

and aging but not to sleep. Continued investigation with a larger sample size is underway to understand if these preliminary observations hold and if CSF velocity in the AoS is associated with glymphatic transport.

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0229

REWARD MOTIVATION IMPROVES PLACEKEEPING PERFORMANCE AFTER TOTAL SLEEP DEPRIVATION AND A NIGHT OF REST

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Introduction: Sleep deprivation impairs some higher-order cognitive processes, but it is unclear if this reflects impaired ability to perform complex tasks, a reduction in motivation, or both. There is evidence that reward motivation attenuates the effect of sleep deprivation on lower-level cognitive processes, namely vigilant attention. We investigated the extent to which reward motivation would mitigate the effect of sleep deprivation on placekeeping, a higher-order cognitive process that plays a central role in accurate performance of procedural tasks. To conduct the study under pandemic conditions, we developed a novel method to conduct sleep deprivation research remotely.

Methods: Participants (N = 414) joined a Zoom meeting in the evening and completed the Psychomotor Vigilance Task (PVT) and a placekeeping task (UNRAVEL). At 00:00, we randomly assigned participants to stay awake in the meeting overnight (Deprivation) or leave the meeting and sleep (Rested). Two trained researchers stayed in the meeting overnight to monitor participants. At 08:30, Rested participants re-joined the meeting, and all participants completed the PVT and UNRAVEL again. Some participants (Motivated), but not others (Nonmotivated), could earn a monetary reward based on their morning UNRAVEL accuracy. Performance on the PVT was completed before the motivation manipulation.

Results: We examined morning UNRAVEL accuracy using a 2 (Sleep: Deprivation, Rested) x 2 (Reward: Motivated, Nonmotivated) between-participants design with evening performance as a covariate. Deprivation participants made more errors than Rested participants, Motivated participants made fewer errors than Nonmotivated participants, and there was no interaction between the factors.

Conclusion: Motivational interventions may be an effective way to mitigate some of the effects of sleep deprivation on higher-order cognitive tasks. However, reward motivation affected Deprivation and Rested participants similarly, and, therefore, did not compensate for impairments specific to sleep deprivation. Consistent with results of studies testing effects of naps and caffeine, the present results suggest that sleep deprivation impairs the ability to perform a procedural sequence accurately in a way that is difficult to mitigate.

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0230

SLEEP DURATION ASSOCIATED WITH HOSPITAL UTILIZATION IN THE US: REVISITING ANDERSEN'S BEHAVIORAL MODEL OF HEALTH SERVICE USE

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Introduction: One in three Americans is sleep deprived, sleep disturbances are associated with greater health service utilization and costs. This study examined factors associated with Emergency Department visits (ED) and overnight admission hospitalization (OA) in a large representative sample of adults aged ≥18 in the US.

Methods: Guided by Andersen's Behavioral Model of Health Service Use, zero-inflated negative binomial and multivariable logistic regressions were used to examine associations between predisposing, enabling, and health needs factors and health service utilization ($\alpha=0.05$).

Results: ED visits significantly increased with age, female sex, Black race, and less than high school education (15%, 36%, and 85%, respectively). Enabling factors analysis found that those who were unemployed, had problems paying medical bills, lived under the federal poverty line, and did not have private insurance were more likely to have ED visits. ED visits also increased by health needs including adults reporting poor/fair health, increased number of chronic conditions, and very short or long sleep. Regarding OA, significant risk predisposing factors included female sex and foreign-born nativity. Factors for OA found adults who were unemployed and had with problems paying bills were more likely to be hospitalized. Adults with Medicaid, Medicare, and other insurance were more likely (70%, 34%, 44%, respectively) to be hospitalized. Of the health needs factors examined, OA odds increased for those with less than excellent health status, without a usual source of care, and an increased number of chronic conditions. Adults with very short or short sleep were also more likely to be hospitalized (48% and 22%, respectively).

Conclusion: This is the first-time sleep duration is examined as a health needs component of Andersen's Behavioral Model of Health Service Use. When determining predictors associated with hospital utilization, sleep duration should be considered a key factor as it significantly increases the odds of ED visits and overnight hospital admissions. Future studies should investigate the influence of other dimensions of sleep health and sleep disorders.

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0231

SLOW WAVE ACTIVITY DURING RESTRICTED SLEEP BUFFERS AGAINST NEGATIVE EFFECTS ON DAYTIME POSITIVE EMOTION IN PRE-PUBERTAL CHILDREN

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Introduction: Increased slow-wave activity (SWA) following sleep loss is a well-established physiological marker of increased sleep pressure. Recent research found SWA changes in response to sleep loss partially accounted for next-day decrements in positive affect (Finan et al., 2015; 2017). To our knowledge, however, this line of inquiry has been limited to adults. Recently, we found greater SWA during a night of healthy sleep predicted greater next-day positive emotion among pre-pubertal children (Rech et al., 2022). Here, we explored whether SWA during the second of two nights of partial sleep restriction predicted next-day emotional responses in the same cohort.

Methods: N=24 healthy, unmedicated children (7 to 11 years) completed a baseline assessment and one night of at-home PSG monitoring (10 hours in bed). Ten days later, children completed one night of at-home sleep restriction (7-hour sleep opportunity) followed by one night of in-lab sleep restriction with PSG monitoring (6-hour sleep opportunity). The next day, children completed an in-lab emotional assessment where they provided arousal and valence ratings in response to positive affective images from the International Affective Picture System (IAPS).

Results: Controlling for age and total sleep time during the first sleep restriction night, hierarchical multiple regression analyses examined if N3 SWA in frontal, central, and occipital regions during the second sleep restriction night predicted IAPS ratings. In separate models, both frontal, $F(1,20)=8.535$, $p=.008$, and occipital SWA density, $F(1,20)=12.313$, $p=.002$, predicted valence ratings in response to positive images (where lower scores indicated more positive valence).

Conclusion: While preliminary, findings indicate relationships between “rebound” SWA after sleep restriction and next-day emotional functioning in pre-pubertal children. Findings suggest that, prior to the pubertal transition, trait-based differences in homeostatic sleep pressure and recovery from sleep loss might alter emotional responding, potentially influencing risk for later mood disturbances.

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0232**A MINDFULNESS INTERVENTION TO IMPROVE SLEEP IN A DIVERSE SAMPLE: RESULTS FROM A PILOT FEASIBILITY STUDY**Dayna Johnson¹, Laura Ward¹, Ashna Jagtiani¹, Leslie Johnson¹, Lauren Barber¹, Unjali Gujral¹¹ Emory University

Introduction: Emerging data suggests that stress is a contributor to sleep health disparities. Mindfulness techniques are effective at reducing stress, yet limited studies have examined its effect on sleep among a diverse sample. We examined stress, sleep, and cardiovascular risk factors before and after participation in a pilot 30-day mindfulness intervention study.

Methods: Among a sample of Asian, Black, Hispanic, and White young adults (n=18), participants underwent 35-days of wrist actigraphy, completed questionnaires on stress (Perceived Stress Scale) and sleep patterns (Pittsburgh Sleep Quality Index) and provided blood pressure and weight measurements at baseline, midpoint, and endpoint. Following approximately 5-days of actigraphy, participants received 1-hour of sleep hygiene education and started a 30-day mindfulness meditation via a mobile application (Headspace™). We calculated means and standard deviations (SD) or frequencies for stress levels, sleep quality, and sleep duration, body mass index, and blood pressure before and after the intervention.

Results: Participants on average were 30 years of age (SD=10.2), 88.9% female, and identified as Asian (11.1%), Black/African American (44.4%), Hispanic (22.2%-not mutually exclusive), and White (33.3%). Most participants had a bachelor's degree or higher (88.9%). After completing the intervention, participants decreased in stress levels [15.7 (SD=7.7) vs. 13.4 (SD=7.5)] and poor sleep quality [8.3 (SD=2.1) vs 5 (SD=2.2)]. The distribution of short sleepers decreased, 27.8% to 11%. There were no changes in actigraphy-measured sleep duration. The prevalence of obesity and elevated blood pressure decreased from 53% to 47% and 16.7% to 11.1%, respectively.

Conclusion: We found it feasible to conduct a 30-day app-based intervention among a predominately racial/ethnic minority population. There were modest decreases in stress, short sleep, obesity, and hypertension after the completion of the intervention. Our results suggest stress reduction may be an avenue to improve sleep and cardiovascular health among racial minorities. These results should be replicated in a larger sample to confirm.

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0233**RACIAL/ETHNIC RESIDENTIAL SEGREGATION - A COMPONENT OF STRUCTURAL RACISM - AND SLEEP HEALTH BY NEIGHBORHOOD-LEVEL POVERTY**Symielle Gaston¹, Jesse Wilkerson², Nat MacNeil², W.Braxton Jackson², Chandra Jackson¹¹ National Institute of Environmental Health Sciences, ² Social & Scientific Systems, Inc., a DLH Holdings Company

Introduction: Racial/ethnic residential segregation may contribute to sleep disparities by concentrating poverty and impairing

sleep among minoritized groups. Yet, due to racism, equitable access to sleep-promoting resources may not occur in integrated neighborhoods. Further, social/cultural factors within ethnic enclaves could be protective.

Methods: To investigate whether relationships between racial/ethnic residential segregation and sleep vary by census tract-level poverty among US adults, we linked nationally-representative National Health Interview Survey data (2011-2017) to 2012 and 2017 American Community Survey census tract-level data. We used the local Getis-Ord Gi* statistic to categorize residential segregation (high, medium, low [reference]), considering differences between racial/ethnic composition within a census tract to the surrounding county. Survey-weighted, Poisson regressions with robust variance estimation were stratified by race/ethnicity and approximate census tract-level poverty tertile (high [>16.9% of residents below poverty level], medium [>7.9%-16.9%], low [0%-7.9%]) to estimate prevalence ratios (PRs) and 95% confidence intervals (CIs) for self-reported sleep health measures.

Results: Among 126,539 participants (mean age±SE=46±0.1 years), non-Hispanic (NH)-Black and Latino adults were most likely to report short sleep (41%) and non-restorative sleep (37%), respectively. Racial/ethnic residential segregation was most common among NH-Black (38%), followed by non-Mexican Latino (34%) and NH-Asian adults (34%), and was least prevalent among NH-White adults (17%) but was not associated with sleep among Mexican, non-Mexican Latino, or NH-Black adults. Among NH-Asian adults, high segregation was marginally associated with a higher prevalence of short sleep (< 7-hours vs. recommended [7-9 hours]) in low-poverty neighborhoods (PR=1.17 [95% CI:0.97-1.42]) but was associated with recommended sleep in medium-poverty neighborhoods (PR_{short sleep}=0.79 [0.63-0.99]). Among NH-White adults, high residential segregation was associated with more restorative sleep only in high-poverty (PR=1.13 [1.06-1.20]) and low-poverty (PR=1.03 [1.00-1.07]) neighborhoods.

Conclusion: Associations between racial/ethnic residential segregation and sleep health varied by neighborhood-level poverty among NH-Asian and NH-White adults. The lack of differences among most minoritized groups may be related to the close proximity of higher-income and lower-income neighborhoods due to structural racism. Future studies including spatial analyses are warranted. The findings/conclusions in this research are those of the authors and do not necessarily represent the views of the Research Data Center, National Center for Health Statistics, or CDC.

Support (if any):

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0234**SLEEP HEALTH DISPARITY AND FRAILITY IN MIDDLE AGED PEOPLE LIVING WITH HIV IN AN AFRICAN SETTING**Xi Zheng¹, Mosepele Mosepele², Ruixue Cai¹, Chenlu Gao¹, Ponego Ponatshego³, Lei Gao⁴, Monty Montano¹, Kun Hu⁵, Peng Li⁵¹ Brigham and Women's Hospital, ² University of Botswana, ³ Botswana Harvard AIDS Institute Partnership, ⁴ Massachusetts General Hospital/ Harvard Medical School, ⁵ Brigham and Women's Hospital/ Harvard Medical School

Introduction: The aim of this proof-of-concept study is to explore sleep health disparity and associations with frailty in middle-aged (i.e., age< 65 years) people living with HIV (PLWH) in an African setting.

Methods: Data were from 98 participants (age: 56.8 ± 4.3 [mean $\pm$ SD] years; female: 49 [50%]) enrolled in Botswana, Africa, between March-December 2021. Forty-eight participants were HIV seropositive (i.e., PLWH) and on suppressive antiretroviral therapy regimens; 50 participants were confirmed uninfected (i.e., controls). PLWH and controls were matched for age and sex. Sleep health was assessed subjectively based on answers to two questions related to sleep quality, and was scored 1 (i.e., better sleep quality) if the participant answered “very much” to question “I am sleeping well” and “not at all” to question “I need to sleep during the day” or 0 (i.e., worse sleep quality) if otherwise. To assess frailty, 29 health deficits related to weight loss, obesity, physical activity, emotion, and fatigue were examined to construct a composite frailty index ranged between 0 and 1 (i.e., 0=no deficit present and 1=all deficits present). Logistic regression and linear regression models were conducted respectively to compare sleep quality (dichotomous) and the frailty index (continuous) between PLWH and controls. In addition, linear regression models were used to examine the association between frailty index and sleep quality stratified by HIV serostatus. All models were adjusted for age and sex. Statistical significance was rendered at $p < 0.05$.

Results: PLWH displayed 2.5-fold higher odds of having worse sleep quality compared to controls (PLWH: 61.4%, controls: 38.6%; $p=0.02$). The frailty index did not differ significantly between PLWH (0.15 ± 0.08 [mean $\pm$ SD]; range: [0.02, 0.36]) and controls (0.14 ± 0.10 ; range: [0.03, 0.56]; $p=0.6$). Within PLWH, having worse sleep quality was significantly associated with an increase in the frailty index (0.76 SD of the group) ($p < 0.001$). No significant association was observed in HIV-seronegative controls ($p=0.4$).

Conclusion: Treated PLWH had worse self-reported sleep than controls, and worse sleep quality in PLWH is linked to an increased burden of physical frailty in Africa. Future studies are warranted to elucidate the causal direction and underlying mechanisms.

Support (if any): Developmental Award (CFAR; P30AI060354); Pilot Grant (HIV&Aging; R33AG067069-02).

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0235

SOCIAL JETLAG AND DIET QUALITY AMONG US YOUNG ADULTS

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Introduction: Young adults are among the populations with the lowest quality diets in the US, and poor sleep could be a contributing factor. Social jetlag, the lack of consistent sleep timing from weekdays to weekends, is also more common among young adults. Our objective was to examine associations between social jetlag and diet quality among US young adults, and to evaluate effect modification by sex or race/ethnicity.

Methods: The study population included 1,308 adults aged 20-39 who participated in the 2017-2018 National Health and Nutrition Examination Survey. Social jetlag was considered as ≥ 2 -hour difference in sleep midpoint (median of bedtime and wake time) between weekends and weekdays. Diet quality was assessed with the Healthy Eating Index (HEI)-2015, which is comprised of 13 dietary components and ranges from 0 to 100 (higher scores=better diet quality). Scores were binned into three groups based on tertile cutoffs. Ordinal logistic regression analyses were utilized to evaluate the relationship between social jetlag and HEI-2015 scores as well as the individual HEI components, adjusting for age, sex, race/ethnicity, educational attainment,

recent tobacco use and physical activity. Effect modification by sex and race/ethnicity were also considered.

Results: In the analytic sample, 31% of young adults had social jetlag. Overall, there were no associations between social jetlag and diet quality. However, interaction analysis revealed several associations were race-specific (P , interaction < 0.05). Among Black adults, social jetlag was associated with lower overall diet quality (OR = 0.4, 95% CI 0.2, 0.8; i.e., less likely to be in higher diet quality tertiles) and more unfavorable scores on total vegetables (OR = 0.6, 95% CI 0.3, 1.0) and added sugar (i.e., OR = 0.6, 95% CI 0.4, 0.9). For Hispanic adults, social jetlag was associated with higher intakes of sodium (OR=0.6, 95% CI 0.4, 0.9). However, White adults with social jetlag had higher intake of greens and beans (OR = 1.9, 95% CI 1.1, 3.2).

Conclusion: Within a nationally-representative sample of US young adults, social jetlag was related to certain indicators of lower diet quality among Black and Hispanic Americans.

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0236

ASSESSING THE IMPACT OF RACE AND INCOME ON CHILDREN'S SLEEP HABITS

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Introduction: Ample research supports the need for adequate sleep to develop normal physical and mental health throughout childhood. While objective sleep monitoring is ideal, it is not always practical in real-world settings. Therefore, subjective reports provide a more realistic alternative. The validated Children's Sleep Habits Questionnaire (CSHQ) requires parents/caregivers to retrospectively report sleep quality in school-aged children. In a nation-wide study, we compared CSHQ ratings to determine any relationship with sleep quality and demographic variables.

Methods: CSHQ and demographic questionnaires were completed for $n=152$ children (ages 3-12y, 63% Male, 37% female), 45% African American and 55% Caucasian. Means of CSHQ scores and demographic variables were compared using independent t-tests and chi-square test of independence.

Results: Overall, African American children had lower reported sleep quality compared to Caucasian children ($t_{150} = -3.77$, $p < 0.001$). Additionally, reported sleep quality was lower in households earning less than 100K compared to those earning more than 100K ($t_{146} = 2.69$, $p < 0.01$), with more African American families earning less than 100K compared to Caucasian families ($X^2(1) = 11.99$, $p < 0.001$).

Conclusion: Our results are consistent with previous research indicating that African American children have lower reported sleep quality than their Caucasian counterparts. While families with lower income report higher rates of sleep disturbance, this appears to be more prevalent in African American households. Although significantly different, both groups reported high levels of sleep disturbance, highlighting the need for general sleep education as well as the development of interventions tailored to different ethnic groups and demographic levels.

Support (if any): Elson S. Floyd College of Medicine Dean's Excellence Award Scholarship

Abstract citation ID: zsad077.0237

0237**DAY-TO-DAY ASSOCIATIONS BETWEEN NIGHTLY SLEEP, SEDENTARY BEHAVIOR AND PHYSICAL ACTIVITY IN UNDER-RESOURCED CAREGIVER-CHILD DYADS**

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Introduction: Sleep and physical activity behaviors co-exist on a 24-hour continuum of movement, and both independently contribute to long-term health. Limited research has examined temporal, day-to-day associations between sleep and activity among caregiver-child dyads dwelling in under-resourced homes. We aim to quantify the temporal, bidirectional associations between objectively measured sleep health metrics, sedentary behavior (SB), and moderate-to-vigorous physical activity (MVPA) among caregiver-child dyads in ecologically valid contexts.

Methods: 26 families (17 caregiver-child dyads and 7 triads; N=55) from socioeconomically disadvantaged Delaware and Philadelphia communities participated in this micro-longitudinal study. Dyads wore an Actigraph on their wrist for up to 14-days to measure sleep health, SB, and MVPA. Sleep health metrics included nighttime sleep duration (minutes), timing of sleep onset and offset (hours), and sleep efficiency (percentage of time in bed spent asleep). Multi-level models quantified the associations between nightly sleep health with next-day SB and MVPA, and daily SB and MVPA with subsequent nighttime sleep. Models adjusted for age, sex, race, day of week, caregiver education, and primary caregiver status.

Results: At the within-subjects level in both children (46% female, 10.37±2.65 years) and their caregivers (85% female, 40.45±11.82 years), nights with longer-than-average sleep duration were associated with less-than-average next-day SB ($p < 0.001$). For caregivers, later-than-average sleep onset time was associated with more-than-average next-day SB ($p = 0.05$), while in children, later-than-average sleep offset time was associated with less-than-average next-day SB ($p < 0.01$). At the within-subjects level in both children and their caregivers, higher-than-average SB was associated with a less-than-average subsequent nighttime sleep duration ($p < 0.001$); and higher-than-average MVPA was associated with higher-than-average subsequent nighttime sleep efficiency ($p < 0.05$).

Conclusion: The complex day-to-day associations between sleep, SB, and MVPA in caregiver-child dyads underscores the consideration of the continuum of 24-hour movement behaviors in family-based sleep health interventions. Furthermore, the similarities in associations between children and their caregivers warrants further investigation of the interrelatedness of family health behaviors.

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0238**NEIGHBORHOOD DETERMINANTS OF SLEEP AND THE MODERATING ROLE OF CULTURAL FACTORS AMONG AMERICAN INDIAN AND ALASKA NATIVE ADOLESCENTS**

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Introduction: Increasing evidence suggests the neighborhood social environment may be an important predictor of sleep, yet this has not been explored among urban American Indian and Alaska Native (AI/AN) adolescents, a population that faces significant health disparities due to exposure to historic and contemporary stressors. This study aimed to examine the association between neighborhood social environment and sleep among Native adolescents as well as the moderating role of cultural factors in this association.

Methods: The sample included 133 AI/AN adolescents (age 12 to 16) residing in urban settings in California (57.1% female, Mage=14.03, SDage=1.35). Perceived neighborhood social environment included safety and cohesion. Perceived cultural factors included identification with Native culture (e.g., I feel a strong attachment towards my tribal group) and historical loss (e.g., Losing our culture). Sleep duration, efficiency, and wake after sleep onset (WASO) were measured via actigraphy. Subjective sleep disturbance was measured via questionnaire. Age, sex, mother's education, depression, anxiety, and body mass index (BMI) were included as covariates.

Results: Greater neighborhood safety was significantly associated with lower sleep disturbance ($b = -2.17$, $SE = .8$, $p = .008$), higher sleep efficiency ($b = -2.17$, $SE = .8$, $p = .008$), and lower WASO ($b = -2.17$, $SE = .8$, $p = .008$), even after covariate adjustment. Neighborhood cohesion was not associated with any sleep outcomes. Cultural factors moderated the association between neighborhood social environment and sleep outcomes (p 's $< .05$ for moderation). Specifically, both neighborhood safety and cohesion predicted lower sleep disturbance only among individuals with greater cultural identity. Further, neighborhood safety predicted greater sleep efficiency and lower WASO only among individuals with greater historical loss.

Conclusion: Findings from this study move the field forward in understanding sleep health among AI/AN adolescents and address the moderating role of culture between neighborhood environment and sleep. The association between neighborhood social environment and sleep outcomes was more robust for urban AI/AN adolescents who more strongly identified with their Native culture and who reported thinking about historical loss more frequently. Research should consider intersecting aspects of social context in predicting sleep outcomes, particularly among groups that face sleep and other health disparities.

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0239

PERCEPTIONS OF SLEEP HEALTH AMONG BLACK AMERICANS: RECOMMENDATIONS FOR IMPROVING SLEEP

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Introduction: Despite African Americans having a high prevalence of poor sleep health, the determinants remain understudied. Sleep disparities research mainly examines quantitative data, with little attention to qualitative data, which can inform targeted interventions. We aimed to qualitatively identify 1) perceptions of sleep; 2) facilitators/barriers to healthy sleep; and 3) preferences for receiving sleep recommendations in a socioeconomically diverse sample of African Americans.

Methods: Participants (N=36 individuals divided into 11 groups) attended online focus groups and discussed the following topics: attitudes and beliefs about sleep, facilitators and barriers to sleep, and knowledge and attitudes about sleep recommendations. Self-reported sleep was measured via the Pittsburgh Sleep Quality Index. The focus group data were analyzed using a rapid analytic approach.

Results: The sample had a mean age of 34 (13.1), and 64% identified as female. The overall prevalence of poor sleep quality, short sleep duration, and long sleep duration was 39%, 24%, and 15%, respectively. Participants defined healthy sleep as a matter of quality over quantity and waking up feeling well-rested. Women, men, and gender non-conforming individuals reported average sleep durations of 6.3 hours, 5.9 hours, and 8 hours, respectively. Women, but not men or gender non-confirming individuals reported disturbed mood because of poor sleep. Regardless of gender, participants reported anxiety, stress, and daily responsibilities such as work, taking care of family, and sudden changes in plans as barriers to healthy sleep. A subset of respondents (25.5%) reported screen time and feeling unsafe as barriers. Men and women reported listening to music, aromatherapy, relaxing, and limiting phone use before bedtime as facilitators to healthy sleep. Men preferred information on how to achieve and maintain deep/quality sleep, whereas women preferred more personalized information on sleep and the sleep-mental/physical health relation. Social media was generally the preferred avenue for receiving sleep recommendations.

Conclusion: Mood, stress, screen time and lack of safety were identified barriers to healthy sleep patterns. Participants were interested in strategies for improving sleep health. Future studies should consider targeting relaxing bedtime routines and enhanced safety as sleep interventions.

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0240

GREENSPACE IN RELATION TO SLEEP HEALTH AMONG A RACIALLY AND ETHNICALLY DIVERSE COHORT OF US WOMEN

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Introduction: Exposure to greenspace has been associated with better sleep health by potentially supporting salubrious activities (e.g., physical activity), buffering noise, improving air quality, and promoting mental health. However, most prior studies have included few sleep dimensions or lacked racial/ethnic diversity. Further, access to greenspace is not equitably distributed across racial/ethnic groups due to structural racism, including environmental justice issues.

Methods: To investigate cross-sectional associations between greenspace with sleep health, overall and by race/ethnicity, we used data collected at enrollment (2003-2009) from women in the Sister Study (n=1,575 Hispanic/Latina, n=4,421 non-Hispanic (NH)-Black, and n=41,628 NH-White). Participants' home addresses (X-Y coordinates) were linked to NASA's Moderate Resolution Imaging Spectroradiometer Normalized Difference Vegetation Index data (250m resolution) during July of the year of enrollment to capture tertiles of proximity to greenspace. Participants reported multiple sleep dimensions including short sleep duration (< 7 hours), insomnia symptoms, frequent napping, and sleep debt (≥2-hour difference between average longest and shortest sleep duration during a week). Adjusting for both individual- and neighborhood-level sociodemographic characteristics, log Poisson regression with robust variance estimated prevalence ratios (PRs) for low/moderate vs. high greenspace associated with poor sleep, overall and by race/ethnicity.

Results: Among participants (mean±SD age=55.7±9.0 years), Hispanic/Latina and NH-Black participants comprised 8% of the population with high greenspace, 15% with low/moderate greenspace, and reported shorter sleep duration and poorer sleep quality compared to NH-White participants. After adjustment for sociodemographic characteristics, neighborhood disadvantage, and population density, low/moderate vs. high greenspace was associated with an 8% higher prevalence of frequent napping (PR=1.08 [95% CI:1.02-1.15]). Low/moderate greenspace was also marginally associated with a higher prevalence of short sleep duration (PR=1.01 [0.98-1.05]), insomnia symptoms (PR=1.03 [0.99-1.07]), and comorbid short sleep with insomnia symptoms (PR=1.04 [0.99-1.10]) but was not associated with sleep debt. Associations did not vary by race/ethnicity.

Conclusion: Low or moderate greenspace was marginally associated with poorer sleep across racial/ethnic groups, supporting greenspace as beneficial for all. Although replication with longitudinal data and objective sleep measures is warranted, greenspace interventions may improve population sleep health; equitable access may help address racial/ethnic sleep disparities.

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0241

SLEEP ACROSS THE LIFESPAN IN HISPANIC/LATINX ADULTS

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Introduction: Studies examining racial/ethnic sleep disparities have observed that minoritized individuals are more likely to experience poor sleep compared to non-Hispanic whites. Existing research on Hispanic/Latinx (H/L) individuals further reinforces this assertion. However, to date, little attention has been paid to lifespan examinations of sleep within minoritized groups. The present study assessed sleep characteristics differences across the lifespan within a large sample of H/L adults. We hypothesized that older adults would report more concerns and symptoms associated with impaired sleep.

Methods: Participants included 1,072 (63.3% female; $\mu=36.43$) adults who self-identified as H/L and completed an online survey assessing insomnia symptoms (Insomnia Severity Index), sleep-related daytime impairment (PROMIS Sleep-Related Impairment), sleep regularity (Sleep Regularity Questionnaire), subjective sleep quality (Pittsburgh Sleep Quality Index), and self-reported sleep duration. A One-Way ANOVA was utilized to detect mean differences in sleep markers across age groups [Young (18-25), Middle (30-50), and Late adulthood (55+)]. Significant mean differences were further analyzed with Duncan's post hoc analysis.

Results: The One-Way ANOVA revealed significant mean differences across all sleep markers analyzed: insomnia symptoms, $F(2, 1069)=67.459$, $p<.001$; sleep-related daytime impairment, $F(2, 1069)=77.465$, $p<.001$; sleep regularity, $F(2, 1069)=74.091$, $p<.001$; sleep quality, $F(2, 1069)=29.300$, $p<.001$; and total sleep duration, $F(2, 1069)=5.898$, $p=.003$. Post hoc analyses revealed significantly more insomnia symptoms ($\mu=14.325$) and poorer sleep quality ($\mu=1.623$) in late adulthood compared to younger ($\mu=8.270$; 1.092) and middle-aged ($\mu=10.186$; 1.345). As well as significant elevations in sleep-related daytime impairment ($\mu_{\text{Middle}}=22.314$; $\mu_{\text{Late}}=23.508$) and poorer sleep regularity ($\mu_{\text{Middle}}=16.556$; $\mu_{\text{Late}}=16.704$) in middle and late adulthood compared to younger adults ($\mu=16.056$; 13.054). Lastly, young adults slept ($\mu=6.756$) significantly less than middle and late adulthood ($\mu_{\text{Middle}}=7.025$; $\mu_{\text{Late}}=7.162$).

Conclusion: Results suggest that age is important factor in the consideration of sleep among H/L adults. These findings generally point to an increase in poor sleep as age increases. It's important to consider this trend when working with minoritized individuals due to the disproportionate burden of sleep factors being potentially compounded by age.

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0242

SLEEP DURATION ASSOCIATED WITH SEXUAL AND GENDER MINORITY STATUS IN THE US: INFLUENCE OF SEXUAL ORIENTATION AND GENDER IDENTITY

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Introduction: The inclusion of sexual orientation and gender identity measurements in national epidemiological surveys allows for the assessment of sleep disparities among sexual and gender minorities. Our objective is to establish the association of sexual orientation and gender identity with sleep duration.

Methods: We used 2020 Behavioral Risk Factor Surveillance System data from 33 states who included the sexual orientation and gender identity (SOGI) optional module in their questionnaires. The outcome variable is sleep duration (≤ 4 hours, 5, 6, 7, 8, 9, and ≥ 10 hours). Main predictors are sexual orientation (heterosexual, gay/lesbian, bisexual, and other) and gender identity (cisgender, trans woman, trans man, and trans gender non-conforming). We estimated multinomial logistic regression models due to the categorical nature of our outcome variable using Stata 17. We estimated models using sexual orientation alone as main predictor, gender identity alone, and then a combined model with both SOGI measures, and adjusted for socio-demographic characteristics and physical and mental health.

Results: Of the complete sample, 92% reported being heterosexual, 2% gay/lesbian, 3% bisexual, and 3% other sexual orientations. In addition, 99% reported being cisgender, and 0.2% reported being trans woman, trans man, and trans gender non-conforming, respectively. In the fully adjusted sexual orientation models, identifying as gay/lesbian was associated with a 27% increased likelihood of sleeping 8 hours and 71% increased likelihood of sleeping 10+ hours compared to heterosexuals. Self-identifying as bisexual and other orientations is associated with an 86% and 52% increased likelihood of sleeping 10+ hours, respectively. In the fully adjusted gender identity models, trans women were 115% more likely to report 8 hours of sleep, 122% more likely to report 9 hours of sleep, and 223% more likely to report 10+ hours of sleep. In the combined fully adjusted model, self-identifying as gay/lesbian, bisexual, or other orientations is associated with a 68%, 84%, and 63%

increased likelihood of sleeping 10+ hours. Trans women are 149% more likely to report 10+ hours of sleep.

Conclusion: Based on our empirical analyses, being a sexual and/or gender minority is associated with a greater likelihood of reporting 10+ hours of sleep.

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0243

SLEEP REGULARITY AND MENTAL HEALTH DURING EXTENDED ANTARCTIC RESIDENCE

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Introduction: As humans' advance towards a Mars mission, ensuring astronaut safety, well-being, and performance becomes increasingly critical. Long-duration space exploration presents several challenges for human sleep, including altered photoperiods, prolonged confinement, and monotony. Antarctica provides an ideal analog for understanding how these and other stressors impact sleep over time. Prior studies among Antarctic cohorts have found reduced total sleep, increased sleep onset, and circadian phase delay. However, day-to-day regularity of sleep-wake patterns in the Antarctic over prolonged periods has not been studied.

Methods: Crew members (N= 110) at a coastal (McMurdo: MM, n = 88) and an inland Antarctic station (South Pole: SP, n = 22) were studied longitudinally for up to 9-months. Sleep was monitored continuously with actigraphy (Actiwatch Spectrum, Philips Respironics) and examined in relation to cumulative time on station and calendar month (photoperiod). Self-reported mental health symptoms were also examined monthly using The Mental Health Checklist (MHCL). The Sleep Regularity Index (SRI; Phillips et al., 2017) which calculates the percentage probability of an individual being in the same state (sleep vs. wake) at any two time-points 24 hours apart was calculated to examine sleep regularity over time.

Results: Controlling for time on station prior to participation, we observed no significant changes in monthly SRI over a 6-month period at MM where photoperiod alterations are less extreme. At SP, SRI remained very stable during months of total daylight but declined during winter months in the absence of sunlight. SRI scores were significantly different between month-8 and month-9 and with large effect sizes across month-7, month-8, and month-9. Participants with lower month-7 SRI scores had significantly higher MHCL poor self-regulation scores at the end of the mission.

Conclusion: Day-to-day variability in sleep-wake patterns is an important predictor of health and safety. Our findings show reductions in sleep regularity during prolonged Antarctic

residence particularly at the SP station, where sunlight is absent for 6 months of the year. Less sleep regularity predicted worse mental health functioning. These findings suggest that mitigation the impact of altered light-dark cycles on sleep is critical for a Mars mission.

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0244

THE RELATIONSHIP BETWEEN SLEEP AND METABOLIC SYNDROME IN LATE ADOLESCENTS: RACIAL DIFFERENCES

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Introduction: Disparities in sleep health and metabolic syndrome (MetS) components co-exist in ethnic/racial minorities. Late adolescents (18-21 y.o.) are a high-risk, yet overlooked population to study sleep disparities and the associated metabolic health. This study aimed to examine the interaction between race and sleep health metrics on MetS components in late adolescents.

Methods: In this cross-sectional study, we enrolled a convenience sample of 60 college students (19.22±1.06 y.o.). Actigraph accelerometers assessed total sleep time (TST), sleep efficiency (SE), and wake after sleep onset (WASO) over one week. Participants completed the Pittsburgh Sleep Quality Index (PSQI) and questions about demographic/socioeconomic information and risk behaviors. A point-of-care test provided the fasting glucose and cholesterol panel. The number (0 vs. >1) of MetS components, including high waist circumference, blood pressure, fasting triglycerides and glucose, and low High-Density Lipoprotein, indicated metabolic health. Logistic regression tested interaction terms controlling for adolescents' age, sex, alcohol consumption, and parents' education, marital status, and family income.

Results: Most participants (n=55; 92%) slept < 7 hours and 43% reported poor sleep (PSQI>5). More than half (n=33; 55%) had at least one MetS component. On average, White (non-Hispanic) participants had higher TST (6.07 vs. 5.63, t=1.93, p=0.06) and SE (84.89% vs. 81.07%, t=2.31, p=0.02) than their racial/ethnic minority (Black/Hispanic/Asian American/other) peers. Race significantly interacted with TST (OR=0.24, p=0.04), SE (OR=0.69, OR=0.10), and WASO (OR=1.08, p=0.02), such that associations of decreasing odds of MetS with increasing TST and SE and decreasing WASO were significant only in the racial/ethnic minority group. Furthermore, racial/ethnic minority adolescents (vs. White) had a greater MetS risk, when TST hours were at low levels (i.e., < 6 hours). Similarly, low SE (< 85%) and high WASO (>60 min) were associated with greater odds of MetS in racial/

ethnic minority (vs. White) adolescents. PSQI scores were not independently associated with MetS or interacted with race in the association with MetS.

Conclusion: Unhealthy sleep is associated with increased MetS risk, particularly for racial/ethnic minority adolescents. Given the greater sensitivity to sleep health, improving sleep quantity and quality may be candidate targets for MetS interventions in at-risk populations who experience health disparities.

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0245

ASSOCIATION BETWEEN NEIGHBORHOOD CONDITIONS AND SLEEP QUALITY IN THE OFFSPRING STUDY

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Introduction: On average, minoritized racial and ethnic groups, including non-Hispanic Black and Hispanic adults, sleep more poorly than non-Hispanic White adults (hereafter, Black and White). Although racial and ethnic sleep disparities have been well-documented, few studies have investigated factors that may contribute to sleep disparities, such as the neighborhood environment. We hypothesized that Black and Hispanic adults demonstrate associations between more positive neighborhood conditions and higher sleep quality.

Methods: In the community-based Offspring Study, we assessed cross-sectional associations between the neighborhood environment and self-reported sleep quality in Black, Hispanic, and White adults (n=993; 27-91 years; M=56, SD=11). Participants self-reported positive (cohesion, safety) and negative (problems, disorder) aspects of their neighborhood experiences on 29 questionnaire items, which were summed on subscales for each aspect of the neighborhood. We assessed sleep quality with the Pittsburgh Sleep Quality Index. Both sleep quality and neighborhood experiences were treated as continuous variables. We performed multivariable regression analyses stratified by racial and ethnic group and adjusted for age, education, and gender identity.

Results: More positive neighborhood experiences (higher neighborhood cohesion and safety; lower disorder and problems) were associated with higher sleep quality in Black, Hispanic, and White adults in unadjusted models. In adjusted models, only neighborhood cohesion was associated higher sleep quality in each racial and ethnic group (Black: 0.17, [0.03, 0.31]; Hispanic: 0.09, [0.03, 0.16]; White: B=0.129, [0.004, 0.25]). In White adults, higher neighborhood problems were associated with poorer sleep quality (B=-0.17, [-0.26, -0.07]). In Black and Hispanic adults, safer neighborhoods (Black: B=0.82, [0.24, 1.41]; Hispanic: B=0.65, [0.37, 0.93]) and lower neighborhood disorder (Black: B=0.14, 0.01, 0.27];

Hispanic: B=0.09, [0.02, 0.15]) were associated with higher sleep quality.

Conclusion: Neighborhood environment may be a driver of individual differences in sleep quality across the adult lifespan. Improving neighborhood conditions may be one method to improve sleep quality and reduce racial and ethnic sleep disparities.

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0246

CURRENT SHIFT WORK AND FRAILTY: FINDINGS FROM THE UK BIOBANK

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Introduction: Shift work may disrupt sleep and circadian rhythms, leading to adverse health outcomes. The objective of this study is to examine whether performing shift work is associated with frailty in middle- to older-aged adults.

Methods: We examined current shift work exposure and frailty risk in 242,126 UK Biobank participants (38-71 years old; 128,595 females). Using the baseline self-reported employment information, participants were categorized as shift workers (with 'work schedule that falls outside of the normal daytime working hours of 9am-5pm') or day workers if no shift work schedule. Based on a previously validated approach, frailty phenotype was identified when three or more of the following five criteria were fulfilled: self-reported weight loss, exhaustion, low physical activity, slow walking pace, and measured low grip strength. Multivariate logistic regression models were used to assess the association between shift work and frailty.

Results: Among 242,126 participants, 201,489 (83.2%) were day workers and 40,637 (16.8%) shift workers. Frailty was identified in 4,308 participants (1.8%), including 3,312 day workers (1.6%) and 996 shift workers (2.5%). Compared with day workers, shift workers were at higher risk for frailty after adjusting age, sex, and ethnicity, i.e., odds ratio (OR) = 1.58 [95% CI, 1.47-1.70] (p < 0.0001). The effect of shift work appeared to be more pronounced in 5,659 permanent night shift workers (OR = 1.98 [95% CI, 1.68-2.32], p < 0.0001). The differences between day workers and shift workers persisted even after further adjusting for social economic status, sleep duration, and chronotype (OR = 1.38 [95% CI, 1.28-1.48] for all shift workers; OR = 1.53 [95% CI, 1.30-1.80] for permanent night shift workers, both p values < 0.0001).

Conclusion: Middle- to older-aged adults who were currently performing shift work, especially those permanent night shift workers, were more likely to be frail. Longitudinal and interventional studies are warranted to elucidate the causal relationship between shift work and the risk of frailty.

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0247

DEVELOPING AND IMPLEMENTING SLEEP HEALTH EDUCATION FOR FOSTER CARE PERSONNEL: A QUALITATIVE ANALYSIS

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Introduction: Sleep during childhood has a major impact on physiological, psychological, and cognitive development, yet sleep health is a neglected part of training/education for foster parents and agency staff. This study examined foster care agency staff perceptions of child sleep problems encountered by foster caregivers in order to inform the development of a sleep health training program for foster care agency staff and caregivers.

Methods: N=36 staff members from public and private foster care agencies in Texas, New York, New Jersey, and Maryland were interviewed remotely. Questions included knowledge of sleep policies, concerns surrounding sleep, methods for addressing sleep concerns, and sleep training recommendations. Two members of the research team coded the interviews using the Atlas.ti program. Coders first independently reviewed and coded transcriptions for thematic key words without formal concepts before reviewing and refining themes/codes with the full research team for consensus.

Results: Eight interviews were coded for this preliminary analysis, focused on response to the question, "What kinds of questions/concerns/requests have you received from foster caregivers regarding children's sleep?" Across the 8 transcripts, the code Fear/trauma associated with bed/sleeping (n = 22 occurrences) and Difficulty Sleeping (initiating, maintaining sleep) (n = 18 occurrences) were the most frequently reported concerns. Other codes included: Behavioral issues affecting issues fall asleep (n=11), Placement adjustment impacting sleep (n = 10); Lack of bedtime routine (n = 9); Concerns surrounding medication (n = 7); and Insufficient sleep impacting daytime functioning (n = 5).

Conclusion: Preliminary findings suggest that sleep training approaches and programs should focus on addressing fear and trauma associated with bedtime and sleeping, as well as establishing a healthy, consistent bedtime routine. Additionally, difficulties with the use of medications, placement adjustment, and behavioral issues manifesting around bedtime should be addressed.

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0248

DISPARITIES IN BED AND WAKE TIMES IN THE US POPULATION

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Introduction: Although quality sleep is crucial for good health, well-being, and cognitive function, racial and ethnic minority populations are at an increased risk of having shorter sleep duration and poorer sleep quality in comparison to other groups. This study, which is nationally representative, intends to show differences in population-level sleep time. Population-level differences in timing have significant public health ramifications because of the important contribution that circadian rhythms play to health.

Methods: Data were obtained from adults who participated in the National Health And Nutrition Examination Survey (NHANES), overseen by the CDC, for the 2017-2018 and 2019-2020 (March, pre-pandemic) waves. These data were combined and weighted using NHANES sample weights. Habitual sleep timing was assessed as self-reported typical bedtime and wake time, which was converted to minutes from midnight. Race/ethnicity was self-reported as non-Hispanic White, Black/African-American, Mexican-American, Other Latinx, Asian, or Multiracial/Other. Covariates included demographics (age, sex), socioeconomic (education, income-poverty ratio), health (body mass index, overall health rating), mental health (depressed mood), and sleep health (sleep disturbance, daytime tiredness).

Results: In the fully-adjusted model, compared to non-Hispanic Whites, Blacks/African-Americans went to bed 17.8 minutes later (95%CI [6.011, 29.497], P=0.003) but did not differ regarding wake time. Asians went to bed 17.8 minutes later (95%CI [6.255, 29.365], p=0.003) and woke up 18.9 minutes later (95%CI [5.222, 32.626], p=0.007). Mexican-Americans went to bed 18.0 minutes earlier (95%CI [-30.722, -5.233], p=0.006) and woke up 33.9 minutes earlier (95%CI [-47.737, -20.112], p< 0.0005). The other groups did not significantly differ from non-Hispanic Whites. As a post-hoc analysis, habitual sleep duration was entered as an additional covariate, and bedtime differences between non-Hispanic Whites and Blacks/African-Americans were no longer significant.

Conclusion: Even after accounting for other elements of sleep, Blacks/African-Americans, and Asians still exhibit delayed sleep. This timing difference may reflect underlying circadian factors, or social ones that may influence timing of sleep. Future work should explore the possibility that circadian disparities exist as

well, and may be related to health disparities since circadian rhythms play so many roles in health.

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0249

INDIVIDUAL DIFFERENCES OF SLEEP PATTERN AND DURATION BETWEEN TWO CONSECUTIVE NIGHT SHIFTS AMONG NIGHT WORKERS

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Introduction: Working at night leads to shortened and disturbed daytime sleep. Night workers usually adopt one of several sleep patterns between consecutive nights: sleeping right after night work (morning sleep), delaying sleep to the afternoon (afternoon sleep), or dividing sleep into two or more episodes (split sleep). However, few studies have examined sleep pattern and duration between consecutive nights in real-world workers. The objective of this study was to examine individual differences in sleep pattern and duration when working consecutive night shifts.

Methods: Night workers (n=241, 43.0±16.5y, 67.2% female) from various occupations who reported working consecutive nights completed an online survey. The survey included questions on socio-demographics and daytime sleep and nap schedules. Sleep pattern (morning vs. afternoon vs. split) and total sleep time (sleep+naps) were derived from survey responses. Cross-tabulations and ANOVA were conducted.

Results: On average, night workers reported a total daytime sleep of 5.37±2.69 hours (range 0-14.25 hours). 65.1% reported morning sleep, 10% afternoon sleep, and 24.9% split sleep. Split sleepers (6.78±2.13 hours) reported longer total sleep than morning (4.86±2.75 hours) or afternoon (5.11±2.37 hours) sleepers. Younger age (< 50y), single marital status, shorter night shift tenure (≤10 years), working ≤3 consecutive shifts, and having ill or disabled dependents were associated with greater prevalence of morning sleep; older age (≥50y), married or separated/widowed, >10 years night shift tenure, working ≥4 consecutive shifts, and having no dependents were associated with greater prevalence of afternoon or split sleep. Having childcare responsibility was associated with more split sleep than no children. Similarly, younger age (< 50y), singles, shorter night shift tenure, working three or fewer consecutive shifts, having ill or disabled dependents, and having a second job were associated with shorter total sleep. However, having childcare responsibility was associated with greater total sleep.

Conclusion: Sleep timing and duration between consecutive nights were influenced by age, marital status, dependents, night work tenure, and number of consecutive night shifts. Future studies are needed to explore what sleep pattern is most beneficial for sleep, performance, safety, and health outcomes of these workers.

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0250

IN-LABORATORY AND AT-HOME SLEEP ASSESSMENTS USING WRIST ACTIGRAPHY IN HEALTHY INDIVIDUALS

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Introduction: Whole-room indirect calorimetry is the gold standard to measure metabolism during sleep. However, it is unknown whether sleep in a room calorimeter is reflective of a person's natural sleep pattern or whether it suffers from limitations common to other in-laboratory assessments, such as the "first night effect". To address this knowledge gap, we compared actigraphy-assessed sleep parameters measured in a room calorimeter with those measured at home to examine how research environments may alter natural sleep quality and patterns.

Methods: Ten healthy individuals (4 females; 41.5 ± 14.5 years old; 25.4 ± 4.2kg/m²) participated in the study (NCT02669212). Participants had no major sleep disturbances (Pittsburgh Sleep Quality Index; PSQI < 5) with minimal anxiety (0-7), assessed using the Beck Anxiety Index. The in-laboratory portion of the study was conducted in a whole-room indirect calorimeter with controlled diets and ambient temperatures. The out-patient, at home study was conducted for seven consecutive nights, further divided into weekday and weekend sleep for analysis. Sleep was measured with an ActiGraph wGT3X-BT accelerometer on the non-dominant wrist throughout the study.

Results: The in-laboratory total sleep time (TST) was 399.7 ± 85.7min, comparable to weekend sleep at home, which was 399.8 ± 57.6min (p=0.998). In-laboratory TST was slightly longer than weekday sleep at home (359.7 ± 69.3min), but was not significantly different (p=0.34). Sleep efficiency in all three conditions was similar for baseline (90.6 ± 6.3%), weekday (91.4 ± 4.5%), and weekend sleep at home (91.1 ± 4.9%). These results suggest that despite being in the laboratory, sleep in healthy individuals was not significantly affected by sleeping in the calorimeter. As expected, seven consecutive nights of sleep at home revealed a tendency for shorter total sleep time during the week (359.7 ± 69.3min) compared to the weekend (399.8 ± 57.6min) (p=0.095), suggesting the presence of social jetlag and circadian misalignment throughout the week.

Conclusion: The present study showed that actigraphy-measured sleep was not affected by sleeping in the whole-room indirect calorimeter in healthy individuals. Further studies would be crucial to address whether this trend holds for other study populations.

Support (if any):

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0251

SEX DIFFERENCES IN THE ASSOCIATIONS OF CHILDHOOD OBESITY WITH SLEEP CHARACTERISTICS, ACCESS TO SCREENS, AND NOCTURNAL MELATONIN

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Introduction: Insufficient sleep and circadian rhythm alterations are associated with metabolic disorders including obesity, with increasing evidence that these associations can emerge in childhood. In parallel, screen media access in the bedroom at night has negative effects on circadian rhythms, sleep, and other behaviors, which can contribute to obesity development. In the current work, we analyzed the associations of childhood obesity with self-reported sleep characteristics, access to screens in the bedroom, and nocturnal melatonin, considering potential sex differences.

Methods: The study cohort is composed of 244 children 7-16 years old, among which 140 have a body mass index z-scores >2 , characterized as obesity according to world health organization criteria. There are 124 girls (11.21 ± 2.42 years) and 120 boys (11.19 ± 2.22 years). Melatonin was measured through immunoassay in saliva samples, which were collected at three time points of the evening of a school day: 4h before sleep, 2h before sleep, and 1h after sleep start. The chronotype score was obtained using the Horne and Ostberg questionnaire. Participants reported the number of screens present in the bedroom at night, and their bedtimes and wakeup times during both weekdays and weekend. The sleep disturbance scale for children and an abbreviated pediatric sleep questionnaire about sleep apnea symptoms were completed by a parent.

Results: BMI z-scores were significantly correlated with more parent-reported sleep disturbances ($p < 0.01$), higher sleep apnea scores ($p < 0.01$), shorter sleep duration during weekdays ($p < 0.01$), and the number of screens in the bedroom ($p = 0.05$) in boys but not in girls ($p = 0.52$, $p = 0.15$, $p = 0.83$, and $p = 0.37$). On the other hand, BMI z-scores were significantly correlated with melatonin level at +1h after sleep onset ($p = 0.05$) in girls but not in boys ($p = 0.96$). No significant correlations were observed between the BMI z-score and the pre-sleep melatonin measures.

Conclusion: According to our findings, there is some differentiation by sex in relationships between body weight and various sleep and circadian measures. Specifically, in boys, obesity was associated with shorter and disturbed sleep with more sleep apnea, whereas in girls, obesity was linked with lowered nocturnal melatonin expression.

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0252

SOCIAL JETLAG, SLEEP VARIABILITY, ITS EFFECT ON SLEEPINESS AND MEDIATION BY SLEEP DEBT: AN EPISONO STUDY

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Introduction: Studies indicate the relevance of the timing system as integrating the causes and antecedents of sleepiness. Recently, social jetlag and sleep variability have been highlighted in regard to their relevance to sleep health. While the circadian misalignment represented by those variables have a known effect on sleepiness, it is often confounded by sleep debt. Therefore, we sought to assess the association between social jetlag, sleep variability and sleepiness, with sleep debt as a mediator in a representative population-based study.

Methods: A representative population-based sample of 1037 participants was analyzed. Participants answered the UNIFESP Sleep Questionnaire and Epworth Sleepiness Scale to collect data regarding sleep timing and subjective sleepiness, respectively. Subsequently, mid-sleep time, total sleep time, social jetlag (absolute difference between mid-sleep time on workdays and mid-sleep time on free days), standard deviation of mid-sleep time and sleep debt (difference between total sleep time on workdays and free days) were calculated. Generalized linear models were conducted to assess if sleep variability and social jetlag had an effect on the Epworth Sleepiness Scale score, with BMI as a control variable. A mediation model was run to test if observed significant effects were mediated by sleep debt.

Results: Average sleep variability was 0.69 ± 0.5 hours, and prevalence rates were 23% for >1 h and 12% for >2 h of social jetlag. There was a statistically significant association between social jetlag and Epworth Sleepiness Scale score, independently of BMI. Moreover, this effect was significantly mediated by sleep debt. No association between sleep variability and sleepiness was observed.

Conclusion: The significant association between social jetlag and sleepiness and its mediation by sleep debt are evidence of their role in sleep health and should be considered as relevant factors in future population-based studies analyzing sleep.

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0253**CONSUMPTION OF A WESTERN DIET IMPACTS SLEEP MICROSTRUCTURE DURING NORMAL SLEEP AND RECOVERY SLEEP – A RANDOMIZED CROSSOVER TRIAL**

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Introduction: While intake of specific macronutrients has been associated with changes in sleep parameters in humans – such as sleep macrostructure – direct interventional evidence is lacking. Thus, we conducted a randomized trial to examine how consumption of an unhealthy, Western diet impacts sleep at the macrostructure to microstructure level in humans.

Methods: In a crossover study, 15 healthy normal-weight men consumed two isocaloric diets in random order: an unhealthy high-fat, high-sugar diet, and a healthy, low-fat, low-sugar diet. Following each week-long diet, in-lab sleep was recorded using polysomnography (PSG), during a full night of sleep, and after recovery sleep occurring after extended wakefulness. Sleep duration, macrostructure and microstructure (sleep oscillatory pattern and slow waves) were investigated using machine learning-based algorithms.

Results: Sleep duration did not differ across the diets, based on actigraphy and the in-lab PSG. Sleep macrostructure was similar after one week on each diet. Compared with the healthy diet, the Western diet resulted in reduced delta power and slow-wave amplitude, but increased alpha and theta power, during NREM sleep. Furthermore, the Western diet also impacted the sleep oscillatory pattern in a similar direction during the recovery sleep.

Conclusion: Short-term consumption of an unhealthy, Western diet modulates restorative properties of sleep, and these changes persisted even into recovery sleep. Whether such changes can mediate adverse health outcomes of an unhealthy diet warrants further investigation.

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0254**DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA USING KOOPMAN SPECTRAL ANALYSIS**

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Introduction: Koopman operator theory and the Hankel alternative view of the Koopman (HAVOK) model have been widely used to investigate the chaotic dynamics in complex systems. Although the statistics of intermittent dynamics have been

evaluated in the HAVOK model, they are not adequate to characterize intermittent forcing. We proposed the Koopman spectral analysis method to characterize the intermittent transition between apneic and non-apneic episodes to predict impending OSA episodes.

Methods: Apnea-ECG Database from Physionet.org was selected to investigate the nonlinear intermittent behaviors of OSA disorder. The data set has 70 records of OSA patients, and the recordings vary from 7 hours to nearly 10 hours each. Each recording consists of a continuous digitized ECG signal and apnea annotations. First, the eigen time-delay coordinates were reconstructed from the heart rate variability (HRV) features. Next, the last eigen time-delay coordinate was modeled as an intermittent forcing component during apneic episodes. Finally, the forcing statistics in OSA were estimated to characterize the intermittency of the pathophysiological process.

Results: The statistics of the forcing in OSA demonstrated the fat-tailed distribution of the intermittent forcing of the underlying OSA pathophysiological process. The pooled means and standard deviations of the burst duration and the inter-burst duration across OSA patients were also calculated to be 1.73 ± 0.26 minutes and 11.71 ± 2.69 minutes. Scalogram amplitude and spectral decomposition of the wavelet transform exhibited various predominant frequencies and dynamics modes associated with apneic events.

Conclusion: We have reported the data-driven HAVOK model to obtain an intermittently forced linear system of chaos for the OSA pathophysiological processes. The proposed method has been validated on 70 records of OSA patients from Apnea-ECG database. The forcing signal can predict the intermittent transient events, such as the transition from normal to apneic episodes in OSA case.

Support (if any): Huynh PK, Setty AR, Le TB, Le TQ. A noise-robust Koopman spectral analysis of an intermittent dynamics method for complex systems: a case study in pathophysiological processes of obstructive sleep apnea. IISE Transactions on Healthcare Systems Engineering. 2022 Nov 1:1-6.

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0255**FEMALE MICE ARE LESS SUSCEPTIBLE TO THE EFFECTS OF DIET-INDUCED OBESITY ON SLEEP AND SLEEP-DISORDERED BREATHING**

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Introduction: Diet-induced obesity (DIO) in male mice is a well-established model of sleep-disordered breathing (SDB). Male DIO mice manifest hypoventilation, increased apnea severity, and sleep fragmentation. The effects of DIO on breathing during sleep and sleep architecture in females have been insufficiently investigated. We hypothesized that female mice are less susceptible to the detrimental effects of DIO on sleep and SDB compared to males.

Methods: Full-polysomnographies were performed in 15 lean female C57BL/6J and 14 female DIO-C57BL/6J mice using a whole-body plethysmography chamber. Ventilatory response to an arousal was calculated as ratio of the average minute ventilation (VE) during each arousal (2.5s) relative to the baseline VE. Breathing stability was measured using Poincaré

plots of VE. Mice were exposed to 8% CO₂ to measure the hypercapnic ventilatory response (HCVR). Mice underwent 24-h metabolic studies.

Results: Obesity was associated with hypometabolism, indicated by reduced oxygen consumption (VO₂) and CO₂ production in DIO mice. VE in 8% CO₂ and HCVR were significantly suppressed suggesting a decreased CO₂ sensitivity in obese animals. NREM sleep duration was reduced, but REM sleep was preserved. Arousal frequency and VE during NREM and REM sleep were similar between groups. However, apnea severity was 4-fold augmented in lean females compared to DIO mice (14.7 ± 3.9 vs 74.2 ± 11.9 events/h; $P < 0.001$). In lean mice, the increased frequency of apneas was mainly attributed to sleep fragmentation since the events were predominantly post-arousals. Breathing stability during sleep was significantly increased in lean mice. Ventilatory response to an arousal was 30% increased in lean females compared to DIO group.

Conclusion: Our results suggest potential sex differences in the effects of DIO on breathing during sleep and sleep architecture. DIO in females appears to be less detrimental regarding SDB severity. The mechanisms underlying the augmented SDB severity in lean females are unknown, but an exacerbated CO₂ responsiveness during sleep related to sleep fragmentation could play an important role.

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0256

MODELING INDIVIDUAL SLEEP NEEDS FROM WEARABLE-DEVICE DATA

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Introduction: There are currently thought to be two processes that interact to regulate one's sleep/wake cycle: a sleep homeostat, which depends on the amount of time you have been awake; and the circadian rhythm, an internal 24-hour molecular clock present in nearly every cell of the body. Both processes differ between individuals, whether that's from a decision to pull an all-nighter or from a genetic inclination towards being an "early bird" or a "night owl". This project focuses on building a model that can predict how sleep disruptions impact an individual's sleep cycle, and the ability to recover from these disruptions.

Methods: A "two-process" model with the capability to simulate a theoretical sleep-wake cycle with disruptions was implemented in Python, and is being tuned using machine learning (ML) on actigraphy data. Actigraphy measures motion using a noninvasive accelerometer embedded into a wearable-device (e.g. FitBit), allowing for the study of sleep activity patterns in a real-world setting. Data was collected from approximately 20,000 individuals, who reside in 121 different countries. ML algorithm was trained and tested on synthetic data generated from the "two-process" model, and then applied to the actigraphy dataset to evaluate prediction accuracy.

Results: Our model has shown that recovery from sleep disruptions can be modeled mathematically, and can be individualized using actigraphy data. The mathematical model was able to successfully simulate the "two-process" interaction, and, by

sweeping parameter values, those that yielded a single sleep bout of 8-9 hours/night were identified. ML algorithm tuning with actigraphy data is ongoing.

Conclusion: Our results suggest that it is possible to predict the sleep patterns of individuals despite disruptions in their schedules from sleep disorders, travel, work, or social and family commitments. Future research should focus on optimization of sleep in individuals using the informational output of our model, and extending it to incorporate the behavioral and/or clinical changes that have proven to improve an individual's sleep. By incorporating this additional set of data, the resulting model can not only predict the impact of disruptions, but also provide recommendations for prevention and recovery based on an individual's input about their lifestyle and their sleep.

Support (if any):

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0257

TOPOLOGICAL DATA ANALYSIS OF ELECTROENCEPHALOGRAPH SIGNALS FOR PEDIATRIC OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is difficult to diagnose and leads to significant complications, including poor rest and heart disease. Identification of OSA in patients typically requires a polysomnogram, which includes acquisition of electroencephalogram (EEG) signals in order to assist with identification of sleep stages. Recent advancements in signal processing technology, including topological data analysis (TDA), provide a novel new way to analyze EEG signals to assist with identification of OSA before disordered breathing occurs.

Methods: We leverage EEG signals from polysomnogram studies included in the Nationwide Children's Hospital Sleep DataBank (NCHSDB) dataset for this study. This dataset includes 3,984 pediatric patients, of which we leverage 2,881 containing usable data. We analyze each sleep state (awake before sleeping, awake in between sleep, awake after study, N1, N2, N3, and REM sleep) individually. We first break the data into 30-second chunks, then compute a distance matrix based on the multivariate time series obtained as part of the polysomnogram for the delta, theta, alpha, beta, and gamma bands individually. We then apply TDA to the distance matrices, leading to a set of persistence landscapes for the 0th homology group. We then group persistence landscapes for OSA positive patients and OSA negative patients, and perform a permutation test for each frequency band, leading to a p-value indicating significance.

Results: Based on our permutation test, we find significant ($p < 0.05$) results in all bands for the N1 ($p=0.0$ for all bands), N2 ($p=0.0$ for all bands), N3 ($p=0.0$ for all bands), and REM sleep ($p=0.023$ for delta band, $p=0.0$ for all other bands) cases. In the cases when the patient is awake, we find significant differences in the delta ($p=0.022$), theta ($p=0.007$), and beta ($p=0.002$) bands in the awake before study case, the delta ($p=0.003$), theta ($p=0.003$), and beta ($p=0.0$) bands for the inter-sleep awake case, and no significant differences in the awake after study case.

Conclusion: Our results indicate that a statistically significant difference between OSA positive and OSA negative patients can be identified when patients are awake through topological data analysis.

Support (if any):

Abstract citation ID: zsad077.0258

0258**ALTERED SLEEP REGULATION IN A MOUSE MODEL OF PARKINSON'S DISEASE**Keith Summa¹, Peng Jiang², Patricia Gonzalez-Rodriguez³, James Surmeier¹, Martha Vitaterna², Fred Turek²¹ Northwestern University Feinberg School of Medicine, ² Northwestern University, ³ Instituto de Biomedicina de Sevilla

Introduction: Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by pathognomonic motor abnormalities that lead to significant disability and morbidity in advanced stages. PD is also associated with sleep abnormalities such as increased fragmentation, insomnia, and excessive daytime sleepiness. Little is known of the underlying mechanisms, in part due to the limited ability of existing mouse models to adequately replicate human PD patient sleep phenotypes. Here we characterize sleep-wake behavior in an innovative genetic mouse model of PD (MCI-Park) targeting a mitochondrial complex I gene (Ndufs2), which experiences progressive dopaminergic neuron loss and displays motor phenotypes resembling those seen in human PD.

Methods: Undisturbed sleep-wake behavior during 12 hr light: 12 hr dark cycles was evaluated in MCI-Park mice during prodromal stages (6-8 weeks of age) and later parkinsonian stages (14-18 weeks of age) as well as in age-matched wildtype littermate controls. Electroencephalographic (EEG) and electromyographic (EMG) recording electrodes were surgically implanted using sterile technique in male and female MCI-Park and wildtype mice. After one week of recovery and acclimation to recording chambers, EEG and EMG were recorded continuously and sleep phenotypes were analyzed.

Results: In prodromal stages, MCI-Park mice exhibited similar overall sleep state amounts compared to wildtype mice, however there were significantly more state shifts as well as longer bouts of wakefulness and shorter bouts of non-REM (NREM) sleep. As mice progressed to parkinsonian stages, these fragmentation measures worsened. In addition, parkinsonian MCI-Park mice experienced a significant increase in wakefulness, a significant reduction in NREM sleep amount, and alterations in REM sleep, with pronounced reductions in REM sleep amount and number of REM bouts. Power spectral analysis revealed consistent decreases in theta2 (also known as alpha) power across all sleep-wake states in MCI-Park mice.

Conclusion: These results indicate that mice harboring a genetic defect causing selective disruption of dopaminergic neurons exhibit progressive sleep abnormalities that resemble sleep disturbances in PD patients. This model thus offers an opportunity to evaluate mechanisms underlying and therapeutic strategies targeting altered sleep in PD patients.

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0259**ASSOCIATIONS BETWEEN EXERCISE, SLEEP, AND MOOD DURING PREGNANCY**Traci McCarthy¹, Sarah Velez¹, Andrea Spaeth¹¹ Rutgers University

Introduction: Sleep and mood disturbances are common complaints among women during pregnancy. Exercise is a non-pharmacological intervention that may help improve sleep and mood;

however the relationship between these variables in pregnancy is unclear. The purpose of the current study is to determine if meeting exercise guidelines during pregnancy associates with improved sleep and mood.

Methods: Women (n=31, 32.5±4.3y) with healthy pregnancies were enrolled in the study during their third trimester (28-32 weeks gestation). Participants completed the Pregnancy Physical Activity Questionnaire (PPAQ), Pittsburgh Sleep Quality Index (PSQI), and PROMIS mood questionnaires and then wore a wrist actigraph and completed a daily sleep diary for two weeks. Participants who reported meeting exercise guidelines (>150 minutes moderate-to-vigorous physical activity [MVPA]/week, EX, n=14, pre-pregnancy BMI 23.7±0.9) were compared to those who reported not meeting these guidelines (< 90 minutes/week, SED, n=17, pre-pregnancy BMI 23.8±0.9). Multivariate ANOVAs were conducted to compare groups on outcome measures and correlations were conducted between exercise, sleep and mood variables.

Results: Exercise guideline groups did not differ in subjective sleep quality (PSQI Global, p=0.23), objective measures of sleep behavior (sleep duration, efficiency wake after sleep onset, and fragmentation, ps>0.10) or in self-reported anger, anxiety, depression or positive affect (ps>0.25). Greater total daily activity associated with improved sleep efficiency (p=0.07) and less wake after sleep onset (p=0.07) but did not associate with mood outcomes. Less wake after sleep onset and sleep fragmentation were associated with higher positive affect (ps< 0.05) and less depressive mood (ps< 0.07).

Conclusion: Meeting exercise guidelines (150 minutes MVPA/week) did not associate with improved sleep or mood in the third trimester of pregnancy. However, greater daily physical activity associated with improved sleep, and improved sleep associated with better mood. Women are particularly interested in non-pharmacological treatment options during pregnancy and these preliminary results support the development of behavioral interventions aimed at increasing daily physical activity in this population.

Support (if any): American College of Sports Medicine Foundation Research Grant awarded to TM.

Abstract citation ID: zsad077.0260

0260**ESTABLISHMENT OF A POLYSOMNOGRAPHY DATABANK FOR SLEEP DISORDERS IN JAPAN**Aoi Kawamura¹, Kentaro Matsui¹, Takuya Yoshiike¹, Yuichi Inoue², Masahiro Takeshima³, Motohiro Ozone⁴, Masahiro Suzuki⁵, Kenichi Kuriyama¹¹ Department of Sleep-Wake Disorders, National Institute of Mental Health, National Center of Neurology and Psychiatry,² Department of Somnology, Tokyo Medical University, ³Department of Neuropsychiatry, Akita University Graduate School of Medicine, ⁴ Department of Neuropsychiatry, Kurume University School of Medicine, ⁵ Department of Psychiatry, Nihon University School of Medicine

Introduction: Polysomnography (PSG) has been suggested to be useful as an objective indicator (biomarker) that contributes to the diagnosis and severity evaluation of various sleep disorders. However, its regular use is still limited to the specialized institutions for sleep disorders. Therefore, PSG is essential for clinical diagnosis of only some sleep disorders, and further application of PSG in conjunction with biomarker development of disorders

including such as insomnia, and psychiatric disorders with comorbid sleep disorders is expected. The aim of this project is to establish a PSG databank for sleep disorders in collaboration with major PSG laboratories in Japan.

Methods: This project is collaborated with medical and research institutions that conduct PSG on a large scale in Japan. The National Center of Neurology and Psychiatry (NCNP) serves as the core institution. The initial collaborating institution is the Tokyo Medical University, which is in cooperation with the Yoyogi Sleep Disorder Center, the largest PSG facility in the Kanto region. We also collaborate with three other core PSG facilities in the Kanto, Tohoku and Kyushu regions: the Nihon University, the Akita University (in cooperation with the Akita Sleep Clinic), and the Kurume University. This project has been approved by the Ethics Committee of the NCNP.

Results: We have stored about 3,000 PSG data evaluated by the standard of the American Academy of Sleep Medicine clinical practice guideline or the traditional Rechtschaffen & Kales standard with adjunct clinical metadata for the past 9 years at the NCNP, about 17,900 at the Tokyo Medical University, about 1,900 at the Nihon University, about 500 at the Akita University, and about 3,000 at the Kurume University. We are continuously collecting and banking data for enhancing research availability of the PSG databank for sleep disorders.

Conclusion: The collected data will be used for research on the development of objective indices for sleep disorders or neuropsychiatric disorders, for which objective indices are lacking in diagnosis and pathological evaluation.

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0261

SLEEP DISTURBANCE RELIABLY PREDICTED BY PAIN SENSITIVITY IN SCIATIC NERVE CRUSH INJURY MODEL

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Introduction: A bi-directional relationship between sleep and neuropathic pain is of interest because of its impact on human health. Numerous studies in humans and animals have examined the association between sleep and neuropathic pain. However, animal studies showed inconsistent results compared to human data. Therefore, validation of an animal model for sleep-pain association research is needed. We examined the animal models to identify a best-fit model predicting sleep disturbances with the level of neuropathic pain.

Methods: Adult male C57BL/6J mice (n=7 per group) were implanted with electrodes for electroencephalogram (EEG) and electromyogram. After two weeks of recovery, we obtained baseline EEG data for 24 hours and evaluated the paw withdrawal threshold, a measure of pain sensitivity, by the von Frey test. Afterward, sciatic nerve crush injury (SCI) and common peroneal nerve ligation (CPL) were conducted to make the two different neuropathic pain models. Post-surgery sleep was recorded continuously for 24 hours, followed by von Frey tests. EEG recording during the light period and von Frey tests were repeated on post-surgery days 5, 10, and 15.

Results: Both SCI and CPL models showed lower paw withdrawal thresholds after the peripheral nerve injury. NREM sleep duration on post-surgery day 1 was reduced significantly compared to baseline in both SCI and CPL, but only SCI showed decreased REM sleep. There was a significant positive correlation between paw withdrawal threshold and NREM sleep duration in SCI ($P < 0.0001$) but not CPL. Also, wake alpha and theta EEG powers were correlated with pain threshold.

Conclusion: We confirmed that both models of neuropathic pain disturbed sleep patterns. Nevertheless, sleep disturbances were reliably predicted by the pain sensitivity in the SCI model. Hence, we suggest SCI as a reliable pain model for studying the mechanism of sleep-pain association.

Support (if any):

Abstract citation ID: zsad077.0262

0262**COMPARING WRIST ACTIGRAPHY TO A NOVEL WEARABLE (ACTIGPATCH): NONPARAMETRIC ACTIVITY ESTIMATION***Alexandros Markowitz¹, David H. Barker², Jared Saletin², Caroline Gredvig-Ardito³, John McGeary⁴, Mary Carskadon⁵*

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Introduction: Wrist actigraphy is a standard for monitoring sleep in the field; however, data quality is reduced if participants remove the device. The Actigpatch is a novel, adhesive water-resistant wearable that we have previously demonstrated as comparable to wrist actigraphy for traditional sleep-wake estimation. Here we compare assessment of nonparametric activity indexes.

Methods: While following fixed schedules, 39 participants simultaneously wore the Micro Motionlogger actigraph (Ambulatory Monitoring Inc., Ardley, NY) on their non-dominant wrist and the Actigpatch (Circadian Positioning Systems, Newport, RI) over the triceps of their dominant arm. Our analyses included 35 participants (21F; 32.9±13.2yrs) who contributed ≥four nights of data (range: 4-14 [mean: 10] nights). After matching devices' tri-axial actimetry in one-minute epochs, we derived key non-parametric parameters of diurnal activity and calculated intraclass correlations to measure agreement. The non-parametric parameters include interdaily stability (IS), intradaily variability (IV), timing of the five hours of lowest activity (L5onset) and ten hours of highest activity (M10onset), and overall relative amplitude (RA).

Results: We observed agreement ranging from good for IS (ICC=0.77 [95%CI=0.59;0.88]; [all mean differences are patch-watch] mean difference=-0.21) to poor for IV (ICC=0.43 [0.12;0.67]; mean difference=0.29). ICC showed good agreement for M10onset (ICC=0.82 [0.67; 0.90]; mean difference=-37min) and excellent agreement for L5onset (ICC=0.91 [0.82;0.95]; mean difference=-2min). Finally, we identified good agreement when estimating the activity relative amplitude (RA ICC=0.86 [0.75; 0.93]; mean difference=0.03). An example of excellent agreement was manifested in the close estimation of L5onset (patch mean=1:04am, SD=70min; watch mean=1:06am, SD=68min).

Conclusion: Adding to our prior evidence that these two devices offer similar sleep-wake estimation using traditional algorithms, the present data indicate the Actigpatch offers good agreement to the Motionlogger for nonparametric analyses of IS, activity timing, and RA. Agreement was not as good for IV, with the Actigpatch showing more intradaily variability than the watch, perhaps due to the triceps placement. Because the Actigpatch is unobtrusive, water-resistant, and can be worn continuously for three weeks, it has potential benefits for

studies of individuals who struggle with adherence to wearing wrist worn devices.

Support (if any): R01AA025593, P20GM139743. Actigpatches provided by Circadian Positioning Systems.

Abstract citation ID: zsad077.0263

0263**FEASIBILITY OF MEASURING SLEEP SPINDLES USING A WEARABLE EEG HEADBAND IN ADOLESCENTS WITH NEURODEVELOPMENTAL DISORDERS***Kathleen O'Hora¹, Jared Saletin², Leila Kushan-Wells³, Carrie Bearden³*

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Introduction: There is compelling evidence that sleep spindles, electroencephalogram (EEG) signatures of non-rapid eye movement sleep, are reliable markers of thalamocortical dysfunction in Schizophrenia. While promising, this research is limited by traditional sleep EEG methods, which cultivate small, non-representative samples. Wearable EEG headbands could be used to study naturalistic sleep across several nights in individuals who cannot tolerate standard sleep assessments, but this has yet to be tested. We aim to test feasibility of using a dry-EEG headband to measure sleep spindles in adolescents with a neurodevelopmental disorder, 22q11.2 Deletion Syndrome (22q11DS).

Methods: Adolescents with 22q11DS (n=7; 3 Females; Age: 15-28 years) were asked to sleep in their own bed wearing a dry-EEG headband (Dreem 3). Feasibility of data acquisition was determined by the ability of the participants to record at least 3 consecutive nights. We performed visual artifact detection and examined the ability to detect sleep spindles using the well-validated Ferrarelli Spindle Detection Algorithm on the F7-O2 electrode.

Results: All subjects completed at least 3 nights of recording (range: 3-5 nights), suggesting the device was well-tolerated. The data contained minimal artifact; 17 out of the 22 nights available for analysis contained artifact in < 20% of sleep epochs. The best night contained artifact in only 6% of sleep epochs. Sleep spindles were successfully detected using an automatic detector (M= 1.92 spindles/minute).

Conclusion: This pilot study suggests dry-EEG headbands offer a feasible method to measure sleep spindles in individuals with neurodevelopmental disorders. This new technology could allow for scalable biomarkers of atypical neurodevelopment associated with psychiatric disorders.

Support (if any): RO1 MH085953; U01MH10171; UCLA Center for Autism Research Pilot Grant; Dreem Coup de Coeur Award

Abstract citation ID: zsad077.0264

0264**UNTANGLING CORRELATIONS BETWEEN POSITIVE AFFECT AND LIGHT AND ACTIVITY DATA USING DEEP LEARNING**Bradley Wheeler¹, Brant Hasler², Meredith Wallace³¹ University of Pittsburgh, ² University of Pittsburgh Department of Psychiatry, ³ Department of Psychiatry, University of Pittsburgh School of Medicine

Introduction: Research has found activity and light data continuously captured via wearable devices predict psychological outcomes. Understanding which sources are most predictive could suggest which biological or environmental factors most impact outcomes. Existing work has largely relied on summary measures of these sources. This may overgeneralize important nuances in the sources that are correlated to the outcomes. We utilized deep learning to predict daily affect based on raw actigraphy and light data to determine which sources are most predictive of daytime positive affect.

Methods: We modeled the daily mean (DMPA) and standard deviation (DSDPA) of positive affect using actigraphy and light data from a cohort of 172 adolescents who completed an ecological momentary protocol for 7-8 days. Positive affect was measured via PANAS-SF and administered via smartphone 5-6 times daily. The outcomes are predicted using the actigraphy and light data during the environmental night (time between astronomical twilight and dawn) prior to each outcome. Convolutional neural networks are used to predict the outcomes using all permutations of actigraphy, white light, and red-green-blue (RGB) light data.

Results: The mean (standard deviation) of the DMPA and DSDPA outcomes were 6.53(1.60) and 1.28(1.15) respectively. Using white and RGB light we could predict DMPA and DSDPA with a root mean squared error (RMSE) of 1.59 and 1.08 respectively (i.e., within 0.99 and 0.93 deviations respectively).

Conclusion: Our work indicates that white and RGB light best predict positive affect. This may indicate that light-based environmental night factors have a larger impact on daily affect than activity-based factors. Most results were within a few hundredths of a deviation from each other, and the channels that best predicted affect differed depending on whether DMPA or DSDPA was modeled. Our methods provide a way to predict affect from raw data and suggest which environmental and biological data have clinical implications towards affect. Important next steps include using time periods related to individual's dim light melatonin onset and comparing findings from deep learning to those based on summary measures.

Support (if any): CARRS Pilot Grant (Wheeler), R01-AA025626 (Hasler), R01-DA044143 (Hasler), RF1-AG056311-04 (Wallace)

Abstract citation ID: zsad077.0265

0265**VALIDATION FRAMEWORK FOR SLEEP STAGE SCORING IN WEARABLE SLEEP TRACKERS AND MONITORS WITH POLYSOMNOGRAPHY GROUND TRUTH**Trung Le¹¹ University of South Florida

Introduction: The rapid growth of point-of-care polysomnographic alternatives has necessitated standardized evaluation and validation frameworks. The current average across participant

validation methods may overestimate the agreement between wearable sleep tracker devices and polysomnography (PSG) systems because of the high base rate of sleep during the night and the interindividual difference across the sampling population.

Methods: This study proposes an evaluation framework to assess the aggregating differences of the sleep architecture features and the chronologically epoch-by-epoch mismatch of the wearable sleep tracker devices and the PSG ground truth. An AASM-based sleep stage categorizing method was proposed to standardize the sleep stages scored by different types of wearable trackers. Sleep features and sleep stage architecture were extracted from the PSG and the wearable device's hypnograms. Therefrom, a localized quantifier index was developed to characterize the local mismatch of sleep scoring.

Results: We evaluated different commonly used wearable sleep tracking devices with the data collected from 22 different subjects over 30 nights of 8-h sleeping. The proposed localization quantifiers can characterize the chronologically localized mismatches over sleeping time. The proposed framework not only characterizes the difference in the sleep stage distribution but also quantifies the chronologically localized mismatches over the sleeping time. Three major components of the framework consist of AASM-based sleep stage classification, sleep staging distribution analysis, and localized comparison analysis. The outperformance of the proposed method over existing evaluation methods was reported.

Conclusion: The proposed research extends our earlier work on evaluating commercial sleep trackers compared to PSG. The proposed evaluation method can be utilized to improve the sensor design and scoring algorithm.

Support (if any): Nguyen, Quyen NT, et al. "Validation Framework for Sleep Stage Scoring in Wearable Sleep Trackers and Monitors with Polysomnography Ground Truth." *Clocks & sleep* 3.2 (2021): 274-288

Abstract citation ID: zsad077.0266

0266**AN MHEALTH INTERVENTION TO DELIVER PERSONALIZED MESSAGES TO INCREASE ADHERENCE TO OSA CARE AMONG TRANSPORTATION WORKERS**Rebecca Robbins¹, Stuart Quan¹, Andrea Troxel², Ralph DiClemente³, Laura Barger⁴, David Rapoport⁵, Kasisomayajula Viswanath⁶, Girardin Jean-Louis⁷, Charles Czeisler⁸¹ Harvard Medical School, ² NYU School of Medicine, ³ New York University, ⁴ Brigham and Women's Hospital; Harvard Medical School, ⁵ Icahn School of Medicine at Mount Sinai, ⁶ Harvard T. H. Chan School of Public Health, ⁷ University of Miami, ⁸ Brigham & Women's Hospital; Harvard Medical School

Introduction: Transportation workers are at risk for obstructive sleep apnea (OSA), yet OSA is commonly undiagnosed in this population. In a two-phase study, we design and evaluate a tailored, mobile health (mHealth) intervention aimed at achieving OSA awareness, including changes in OSA beliefs, among operators of large highway maintenance vehicles.

Methods: In Phase 1, we recruited highway maintenance vehicle operators employed at worksites in the US northeast for focus groups to examine OSA beliefs and barriers. Results of the Phase 1 focus groups were used to inform the tailored intervention. In Phase 2, we evaluated the tailored approach, "Sleep Strong, Live Long," in a mini-RCT. Worksites were randomized to intervention (Sleep Strong, Live Long) or control. Employees at both worksites completed baseline questionnaires and

follow-up questionnaires 2-months post-baseline. Employees at the intervention worksite received a 30 minute in-person education session, access to an interactive website including video success stories, then follow-up text messages over 2 months as part of the Sleep Strong, Live Long program. The control condition received the intervention after completing follow-up surveys. We compared responses on the follow-up surveys between intervention and control conditions using linear regression with baseline responses as covariates.

Results: Phase 1 themes included common sleep complaints, inconsistent work schedules, and misconceptions about OSA (n=45). 75% of Phase 1 participants reported resistance to OSA behavior change. Phase 2 mini-RCT participants (n= 38) were on average 43.4 (sd=12.1) years old. Participants were 86.8% male and 67.6% reported an annual household income of \$50,000 or more. Exposure to the intervention was associated with an improvement in OSA literacy (b=0.14, p=0.037), but not OSA self-efficacy (b=0.12, p=0.330) or OSA readiness to change (b=0.76, p=0.336).

Conclusion: We provide preliminary support for improving OSA literacy among a sample of transportation workers. Future research may evaluate the tailored program in a larger sample of workers and with a longer follow-up period to consider whether OSA literacy and self-efficacy mediate actual OSA behaviors, such as changes in OSA evaluation and treatment.

Support (if any): This work was supported by the National Heart, Lung, and Blood Institute (NHLBI) at the National Institutes of Health (NIH, Grant # K01HL150339).

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0267

DEVELOPMENT AND VALIDATION OF LOW-LEVEL TRANSCRANIAL ELECTRICAL STIMULATION TO ENHANCE SLOW OSCILLATIONS DURING HUMAN NREM SLEEP

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Introduction: Sleep disruption, and in particular decreased NREM stage N3 sleep, has been implicated in cognition and pathogenesis of Alzheimer's Disease (AD). Several recent findings suggest that enhancing N3 sleep may mitigate impairments due to chronic sleep disruption. However, approaches such as transcranial electrical stimulation (TES) have been limited by discomfort, awakenings, and lack of blinding. In response to the need to develop low-level TES, our team first identified the source of slow oscillations (SOs) of N3 sleep using high-density EEG array modeling (SourceCER®), which localized within anterior limbic brain structures. Next, we showed that low-level TES targeted to this region induced and enhanced SOs during N3 sleep in the laboratory. More recently, we developed a portable TES device with the minimum deployable set of stimulation electrodes targeting the anterior limbic SO-generating regions: Wireless Interface Sensor Pod (WISP).

Methods: Thirteen healthy adults (m = 42 years) participated in three all-night sleep EEG recordings where they received low level (0.5 mA) TES designed to target anterior limbic

SO-generating regions and a sham stimulation (placebo). TES was initiated after 4 minutes of naturally occurring NREM N2 sleep and included five TES blocks of five minutes each separated by one minute rest periods. Subjects were blinded to stimulation and sham conditions, and outcomes included feasibility, acceptability, and total time in each sleep stage. A convolutional neural network (CNN) was developed, trained, and tested on manually scored EEG sleep staging for automated sleep scoring.

Results: Subjects rated that the WISP device was highly feasible and acceptable. Subjects were adequately blinded to sham versus stimulation. When compared to the sham session, limbic-targeted TES significantly increased the duration of N3 sleep and spectral power in the 0.5-1 Hz frequency band. Finally, our CNN was able to detect sleep stages with good accuracy (84%, kappa 0.77).

Conclusion: These results suggest that low-level portable TES using a minimum deployable set of electrodes, when specifically targeting anterior limbic sites, is feasible, acceptable, maintains blinding, and increases deep (N3) sleep. The WISP device is a promising method to both assess and manipulate sleep in the home setting.

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0268

MATHEMATICAL RECURSIVE MODEL PRESENTING A FORMULA TO OPTIMIZE APNEA-HYPOPNEA INDEX BASED ON SLEEP STAGE AND SLEEP POSITION

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Introduction: Despite apnea-hypopnea index (AHI) being the gold standard in diagnosing obstructive sleep apnea, AHI can be further optimized if AHI is differentiated according to sleep stages/positions, then integrated with weighted time. The primary aim of this study is to demonstrate the mathematical modeling process from which 'projected AHI' (pAHI) can be calculated.

Methods: With the hypothesis of the nth projected AHI, expressed as AHI_n, being the gold standard and AHI_0 being test results, using AHI of 5 as cutoffs, subjects were grouped into a confusion matrix of TN_n, FP_n, FN_n and TP_n. Through recursive optimization, information obtained from AHI_0 and AHI_n was used to calculate AHI_(n + 1). The coefficients of the equation to calculate AHI_(n + 1) consisted of A_(n + 1), B_(n + 1), C_(n + 1), and D_(n + 1), each representing the % of total time of each of the four types of sleep (REM supine, REM non-supine, NREM supine, NREM non-supine) out of the people in the groups TN_n and FP_n. We tested a closed polysomnographic dataset of 337 subjects to determine the point at which all four coefficients would stay constant, producing the ideal pAHI of the dataset.

Results: Each of the four coefficients of the equation converged at n = 3. At n = 3, A_3 = 0.090, B_3 = 0.087, C_3 = 0.433, and D_3 = 0.390. The patients in the groups TN_2 and FP_2 turned out to be the same patients that were in the groups TN_3 and FP_3, explaining why each of the four coefficients of the equation converged at n = 3, and continuously onwards. As a result, it logically follows that for all n > 2, the formulas of AHI_n were determined to be equal in this closed dataset.

Conclusion: Ideal pAHI is not a fixed formula. Instead, a recursive optimization model can generate an ideal formula in a big data set when each coefficient of the equation converges. In addition, the recursive optimization model used in our pAHI can be

particularly useful in machine learning as new data sets are prospectively added to the existing data.

Support (if any): n/a

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0269

NO MORE ACTIWATCHES: CAN APPLE WATCHES BE A MORE SCALABLE ALTERNATIVE?

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Introduction: The Philips Respironics Actiwatch has become a gold standard for actigraphy data collection. With the announcement of their discontinuation, there has been increased momentum to identify an alternative, particularly with consumer-based devices. One promising solution is the Apple Watch because it allows user access to raw accelerometer data, thus eliminating the long-standing problem of the “black box algorithm” with wearable technology. This study compared the activity counts derived from Apple Watch data with that from the Actiwatch.

Methods: Adults wore an Actiwatch and Apple Watch on the same non-dominant wrist for 7 to 14 days (mean = 9). Accelerometer data were recorded and activity counts were derived from accelerometer data (algorithm for Apple Watch from Lindert et al, 2013). Daily sleep diaries were also completed. Actigraphy activity counts were binned into 2, 5, 10, 30, and 60 minute bins to examine concordance by bin sizes. Agreement between Apple Watch and Actiwatch were quantified with Lin's Concordance Correlation Coefficients (CCC) across bins. Usability was assessed utilizing an exit survey.

Results: In increasing order of bins, the CCCs were: .63 (2 mins.), .70 (5 mins.), .78 (10 mins.), .90 (30 mins.), and .92 (60 mins.). Agreement was substantial for bins of 5 minutes or greater with 30 and 60 minutes showing the strongest agreement. The y-intercepts for all bins were positive indicating that Apple Watches were more likely to detect activity counts compared to Actiwatches. In terms of usability, a large majority (88%-100%) of participants favored the Apple Watch for comfort, convenience, preference to wear in public, and preference to wear again. The only dimension where there was not a clear preference was ease of use, with 56% indicating a preference for the Apple Watch.

Conclusion: This is the first study supporting Apple Watch as a potentially feasible alternative to an Actiwatch. Given that the Apple Watch's accelerometer appears to be more sensitive, use of a different algorithm for determining activity counts from raw accelerometer data may improve the concordance at smaller bins. Future research should explore the effectiveness of the Apple Watch for sleep/wake detection in clinical samples.

Support (if any):

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0270

OBSTRUCTIVE SLEEP APNEA DETECTION USING ECG MORPHOLOGY AND MACHINE LEARNING

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Introduction: Obstructive Sleep Apnea (OSA) is characterized by reduction in airflow. Hypopnea is a smaller reduction in airflow

compared to apnea but also accompanied by drop in oxygen saturation leading to sympathetic activation. Frequent OSA events are correlated with incidence of cardiovascular diseases. Measuring changes in airflow requires overnight polysomnography that is expensive. Electrocardiogram (ECG) is available through wearable devices at home and therefore, detecting OSA events using ECG can make OSA diagnostics more accessible. This paper studies the use of ECG morphology and an ensemble machine learning algorithm to detect OSA events. The algorithm designed is light weight to ensure that it can be implemented on an embedded processor.

Methods: The data from the Apnea, Bariatric surgery, and CPAP (ABC) study provided by the National Sleep Research Resource is used for the analysis. Twenty-six subjects diagnosed with severe OSA are considered with single night polysomnography before treatment. Since OSA events have a minimum 10s duration, 10s non-overlapping windows with OSA labels from a technician scoring is used. Features are extracted from the PQRST complex and majority voting across multiple algorithms is used to select the top 7 features (SDNN, RMSSD, P-P interval, P-duration, P-R interval, T-duration and T-P interval) with highest explanatory power. We train a random forest classifier using leave-one-out methodology where 25 subjects are used for training and the 26th subject is used for testing (all permutations are used). We use sensitivity, precision and F1 score for evaluation.

Results: The algorithm detects the precise occurrence (onset and offset) as well as the total number of events during the night. The precision, sensitivity and F1 scores are 70%, 96% and 80% respectively. The prediction leans towards higher occurrence of OSA events as the subjects suffer from severe OSA. We uncover 32% of false positives are events that are accompanied by significant SPO2 desaturation pointing to the inaccuracy of manual scoring. Assuming these false positives are correct predictions the precision increases to 79%.

Conclusion: The classification of OSA events using ECG features and machine learning demonstrates the feasibility of using wearables to measure OSA in a home setting.

Support (if any):

Abstract citation ID: zsad077.0271

0271

PATTERNED PLANAR BED SURFACE VIBRATION IS EFFECTIVE IN SHORTENING TIME TO ONSET OF SLEEP (AS GOOD AS A SLEEPING PILL?)

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Introduction: 70 million Americans suffer from poor sleep, 42 million have a chronic sleep disorder, and an estimated 64% report regularly taking a pharmacological sleep aid regularly with well-known risks. A link between vibration and sleep was first observed during investigations of highway hypnosis. We developed a prototype bed producing sub-audible, tactilely perceptible traveling-wave vibration where noninvasive sleep monitors could objectively measure sleep.

Methods: A bed was outfitted with low-frequency effectors (LFEs) and phasers to create infrasonic, low-frequency vibration that traversed the mattress in patterns. Amplitude was adjusted to comfort using a bedside dial. Sleep was monitored

over four sequential weeks in a single 22-year-old healthy male subject with 3 devices each employing a unique mechanism: the OuraRing (actigraphy), Google NestHub (GHz radar chip), and SleepScore (ultrasound). No vibration was used during weeks 1 and 4 to establish a baseline/return to baseline. Week 2 vibration was a highly periodic waveform (25 Hz, migrating at 1 Hz), while week 3 vibration was an irregular, chaotic waveform. Objective data was collected from the 3 devices to plot total sleep duration and latency of onset.

Results: 1. Strong agreement was seen among the 3 different sensors 2. Patterned, highly periodic, low-frequency vibration shortened sleep latency by nearly 50% consistently for one week (from 15 to 8 minutes) 3. Chaotic, irregular vibration of week 3 also shortened latency, but less so (from 15 to 12 minutes) 4. Baseline and repeat baseline were statistically nearly identical 5. Sleep duration was not impacted by vibration (mean 7 hours 45 minutes)

Conclusion: The primary mechanism of improved latency with vibration may be somatic/mental distraction. The subject reported that vibration diverted away from pre-occupying thoughts and was highly pleasant. These observations were reflected in nearly 50% reduction of latency in week 2 and more modest reduction in week 3. Patterned planar vibration appears as effective as prescribed sleep medications, suggesting it may be a useful non-pharmacologic sleep adjunct.

Support (if any): Jacob Bentley is the recipient of scholarship support for this research from the American Medical Association and AASM.

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0272

BINAURAL BEATS AT SLOW FREQUENCIES LESS THAN 1 HZ MAY INDUCE SLOW-WAVE SLEEP FASTER

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Introduction: Binaural beats are an auditory phenomenon when two sounds with a certain frequency difference are transmitted simultaneously to each ear, one perceives a beat with a frequency exactly equal to that frequency difference. Previous studies have shown that binaural beats synchronize neural oscillations and induce related brain states and behaviors. One previous study showed that listening to binaural beats at 1 Hz during naps increased the duration of slow-wave sleep. However, the effect of binaural beats in the slow frequency range (< 1 Hz) on sleep is poorly understood.

Methods: We hypothesized that 0.25 Hz-binaural beats could synchronize slow neural oscillations and thus enhance slow-wave sleep by shortening its latency and lengthening its duration. Twelve healthy subjects (six females, 25.3 ± 2.6 years) were included in this study. The experiment consisted of four 90-minute afternoon naps, including a sham condition (no acoustic stimulation) and three binaural-beat conditions (0 Hz, 0.25 Hz, 1 Hz) with a 250 Hz carrier tone. Participants were not informed of these conditions. Auditory stimuli were delivered through headphones and continued throughout the 90-minute nap.

Results: The results showed that the binaural-beat condition at 0.25 Hz had shorter latencies for both N2 and N3 than the sham stimulus condition.

Conclusion: This study suggests that binaural beats at slow frequencies, such as 0.25 Hz, may induce slow-wave sleep faster in healthy individuals.

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0273

ADVANCED ASSESSMENT OF SLEEP DERIVED FROM HYPNODENSITY

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Introduction: In a recent analysis of PSG studies with six, nine and twelve human scorers, we showed that sleep stage ambiguity is the rule rather than the exception, and that sleep stage probabilities (SSPs) calculated with artificial intelligence provide an excellent estimate of this ambiguity. Here we investigate clinical and demographic factors driving this ambiguity and evaluate potential benefits of using hypnosity in addition to the traditional hypnogram for sleep assessment.

Methods: SSPs were determined in 195 healthy subjects aged 20–95 years and in 49 apnea patients aged 29–73 years (AHI: 5.8–105.5 events/hour). In addition to the recommended sleep parameters, we derived the percentage of ambiguous sleep stages (SSP ≤ 0.95), the mean amount of ambiguity per sleep stage (1-SSP), sleep stage continuity (absolute difference in SSP between two epochs) and sleep stage stability (two adjacent epochs belonging to the same sleep stage with SSP > 0.95 each) as well as NREM sleep depth (weighted average of NREM SSPs).

Results: The percentages of ambiguous NREM epochs (±SD) increased significantly with age (Pearson's $r=0.72$; $p<0.01$) from 40±9% in young healthy subjects (20-39 years, $n=61$) to 50±9% in middle-aged healthy subjects (40-59 years, $n=59$) and to 62±11% in older healthy subjects (≥ 60 years, $n=75$). The percentages of ambiguous REM epochs did not change significantly across age ($r=0.1$). Apnea patients showed an increased NREM ambiguity (77±15% compared to 53±10% in age- and sex-matched healthy controls; $p<0.01$), while REM ambiguity was only slightly increased ($p<0.05$). Furthermore, sleep stage continuity, stability, and NREM sleep depth decrease significantly with age and are significantly lower in apnea patients than in healthy controls ($p<0.01$).

Conclusion: Artificial intelligence-based autoscoring shows ambiguity in 40% of NREM epochs in young healthy subjects, increasing to 77% in apnea patients. Assigning a single sleep stage to each epoch and presenting sleep architecture as a traditional hypnogram may be misleading, especially for older subjects and patients with sleep-disordered breathing. A hypnosity chart representing sleep stage probabilities reflects this sleep staging ambiguity, provides all the information contained in a hypnogram, and offers insights into sleep ambiguity, continuity, stability, and sleep depth.

Support (if any):

Abstract citation ID: zsad077.0274

0274**COMPARING SLEEP ARCHITECTURE IN APPLE WATCH SERIES 7 WITH SLEEPIMAGE RINGS**Sanket Meghpara¹, Rijesh Niraula², Dana Awad³,
Lourdes DelRosso⁴, Lynn Keenan², Karl Van Gundy¹¹ UCSF Fresno Sleep Program, ² UCSF-Fresno, ³ Eisenhower Medical Center Residency Program, ⁴ UCSF- Fresno

Introduction: The awareness of the importance of healthy sleep is increasing in the community, hence many devices were developed in the last decade to help recognize sleep architecture. Studies that assessed the matching between sleep rings and iOS systems in apple watches are limited. We aimed to show that the Apple watch can be a useful tool in evaluating sleep architecture for many sleep disorders by comparing it with sleepimage rings.

Methods: We conducted home sleep studies on 1 participant for 7 nights using SleepImage rings and Apple Watch Series 7 with sleep health simultaneously. The participant is a healthy 32 year old male. N1, N2 and N3 stages of sleep were clumped together as NREM in the apple watch for comparative data. Data collected included total sleep time (TST), time in bed (TIB), time in REM, and time in NREM. Data was analyzed with IBM SPSS v. 29.0.0 using descriptive statistics. Mann Whitney test for comparison with $p < 0.05$ considered significant.

Results: Data in minutes included mean TST with watch 408.7, standard deviation (SD) 44.3 and with ring 404.57, SD 47.1 ($p=0.902$). Total NREM sleep with watch 330.1, SD 32.8 and with ring 337.8, SD 42.3 ($p=0.620$). Total REM with watch 72.7 SD 19.5 and with ring 66.7 SD 13.1 ($p=0.535$). Total TIB with watch 475.3 SD 20.8 and with ring 421.4 SD 52.8 ($p=0.017$).

Conclusion: We found no statistically significant difference between the sleep ring and apple watch in estimating TST, REM-sleep and non-REM sleep. The only measurement that was significantly different is the time in bed. This report suggests that Apple Watch can be used as an adjunctive tool for sleep architecture for treating sleep disorders.

Support (if any):

Abstract citation ID: zsad077.0275

0275**DEEP LEARNING-BASED SLEEP DETECTION USING TORSO PATCH VITAL SIGNS IMPROVES SLEEP-WAKE DETECTION OVER WRIST ACTIGRAPHY**Matt Pipke¹, Srilakshmi Alla², Jadranka Sekaric², Dylan Richards²,
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Introduction: Motion-based wearable sensors, typically on wrist, have long been used for free-living sleep detection and quantification. However, it is hard to differentiate sleep from sedentary awake time by immobility alone. Vital signs, like heart rate and respiration rate, can greatly enhance determination of wake-sleep state, and are easily monitored with newer wearable sensors. Deep learning techniques are particularly adept at learning labeled physiological states. By combining movement

plus vital signs in a deep neural network algorithm, improved sleep detection, fragmentation and sleep staging should be possible compared to activity alone. We report on performance of a deep learning sleep detection and REM/NREM algorithm providing 24-hour evaluation with high specificity using data from a torso-wearable patch sensor as compared to polysomnography (PSG).

Methods: Twenty-six healthy adults (mean age 53.7 years, 81% female) contributed 150 nights of PSG during laboratory visits, during which participants simultaneously wore a multi-day skin-adherent patch with continuous single-lead ECG and 3-axis accelerometer streams, as well as a wrist activity monitor. A pre-trained deep neural network algorithm generated epoch-level Wake/REM/NREM classification (Sleep equals REM plus NREM) using vital signs and movement derived from the patch sensor ECG and accelerometer waveforms and was then compared to expert human staging of PSGs. The wrist actigraphy sleep-wake determinations (Actiware) were also compared to PSG.

Results: Data includes 900 hours sleeping and 139 hours awake, of which 195 hours of sleep were in REM state. Using patch data, the deep neural net algorithm achieved 92% sensitivity and 85% specificity to detect sleep as compared to PSG; REM was detected with 85% sensitivity and 97% specificity. By comparison, the wrist motion-based algorithm only exhibited 33% specificity and 95% sensitivity, essentially overcalling immobile wake as sleep.

Conclusion: Sleep evaluation in free-living environments with wearable sensors can be greatly improved over conventional motion-based wrist sensors by leveraging continuous vital signs. Deep learning-trained neural network algorithms are particularly effective for use with such data, as demonstrated with this algorithm.

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0276**DETECTING APNEA HYPOPNEA INDEX FOR CLASSIFIED THE SEVERITY OF OBSTRUCTIVE SLEEP APNEA USING PPG SIGNALS**Amy Chiu¹, Yao Shiao², Yu Ting Liu², Chia Mo Lin³, Chia Chi Chen⁴¹ GoMore Inc., ² GoMore, ³ National Central University, ⁴ Shin Kong Memorial Wu Ho-Su Hospital

Introduction: A polysomnography or home sleep apnea study provides multiple pieces of information to diagnose obstructive sleep apnea (OSA), but the tests are costly with limited access. The study aims to use an automated AHI model with only PPG signals and can be applied to a wearable device.

Methods: We have included patients with different OSA severity to build an algorithm detecting ODI based on the scoring criteria with varying sizes of windows ranging from 10 to 60 seconds. For patients without ODI events, the automated CPC for detecting low-frequency oscillation is included to support the automated AHI model.

Results: The automated ODI and the combination of automated CPC are highly correlated with the AHI. When a CPC is detected without the ODI, the low-frequency coupling can assist in detecting AHI. The accuracy of the automated AHI is

86% compared to the actual AHI, with the sensitivity, specificity and precision at 92%, 73% and 89%, respectively.

Conclusion: The automated AHI algorithm with PPG signals as input can have a high sensitivity and accuracy in screening patients with OSA (AHI $\geq$ 5), which can considerably be implied in a PPG wearable device.

Support (if any):

Abstract citation ID: zsad077.0277

0277

IMPROVING THE VALIDITY OF SELF-REPORTED SLEEP DURATION: EXPERIMENTAL COMPARISONS OF QUESTION FORMAT WITH ACTIGRAPHY

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Introduction: Accurate measurement of sleep is a challenge for researchers and practitioners. Objective measures (i.e., polysomnography, actigraphy) are expensive and time-consuming. Thus, the practical approach is self-report – with the cost of reduced validity. The purpose of this actigraphy experiment was to compare the validity of differently formatted self-reported sleep duration measures. It was hypothesized that question formats which encourage duration reporting to the nearest 15 minutes would lead to improved validity.

Methods: Adults (n=56, 73.2% female, 80.4% white, mean age = 21.3 years, SD = 4.18) were recruited through university email, a psychology participant pool, and word of mouth. Sleep was recorded via actigraphy for 7 days. Participants were randomly assigned to respond via computer to one of three versions of the Pittsburgh Sleep Quality Index (Buysse et al., 1989). Specifically, they reported hours of sleep per night in one of the following formats: 1) Open-ended response with standard instructions 2) Open-ended with modified instructions to “round to the nearest 15-minutes”, or 3) Standard instructions with drop-down menus to select hours and minutes (15-minute increments).

Results: Self-reported and actigraphy sleep duration were strongly correlated, $r = .63$, $p < .001$. Average self-reported duration (7.05 hours) was significantly longer than actigraphy average (M = 6.65 hours), $t(55) = 3.27$, $p < .01$, $d = 0.44$. There were no significant differences across the three self-reported sleep duration formats, $F(2, 53) = 0.02$, $p = .98$, $\eta^2 = .00$. As expected, the open-ended standard format had the weakest correlation with actigraphy ($r = .47$), whereas the open-ended with modified instructions ($r = .74$) and drop-down menu ($r = .68$) versions were better predictors of actigraphy duration. The effect sizes for the improvement ($q = .44$, $.32$) were medium in magnitude (Cohen, 1969).

Conclusion: The results suggest that researchers and practitioners should consider the format of self-report sleep duration questions. We found formats that encourage participants the reporting of more precise estimates to more strongly predict actigraphy. Additional data is needed to replicate these findings, and for a better understanding of the factors that influence the magnitude of agreement between objective and subjectively reported sleep duration.

Support (if any):

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0278

PATIENT SATISFACTION WITH A NOVEL SLEEP TELEHEALTH PLATFORM IN THE US MILITARY

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Introduction: Despite a high prevalence of sleep problems, there is a gross shortage of sleep clinicians within the military health system. To increase access to care, a novel telehealth platform was designed to empower patients and clinicians to make evidence-based sleep treatment decisions. Here, we present initial results from the implementation of this novel sleep telehealth platform in two military treatment facilities (MTFs).

Methods: Participants (N=305) with sleep complaints were recruited remotely and/or in-person from two MTFs. Participants were predominately men (53.4%), who self-identified as White (55.4%) or Black (24.1%) race and were retired or active-duty military servicemembers (69%). Average age was 45.9 (SD=13.3) years. Participants completed a baseline assessment including standardized research questionnaires via a mobile application (WellTap®). During a 10-day remote monitoring assessment, participants completed daily sleep diaries and twice-daily mood/daytime function surveys, while wearing a commercial-off-the-shelf device (Fitbit®). A personalized sleep report including evidence-based treatment recommendations was provided. Participants completed a satisfaction survey regarding the remote monitoring assessment.

Results: The most commonly reported sleep problems were difficulty staying asleep (65%), insufficient sleep (61%), and snoring (40%). Most participants described their sleep quality as “a little good” (51%) or “not at all good” (27%). Thirty-nine percent of participants reported moderate to severe insomnia complaints, 38% reported moderate to severe excessive daytime sleepiness, and 22% reported moderate to severe depressive symptoms. In terms of satisfaction, participants reported the sleep assessments were “easy” to complete (92%) and would consider sleep telehealth approaches in the future (95%). The vast majority of participants preferred to continue with sleep telehealth and preferred to combine a mobile app and remote monitoring with either virtual or face-to-face provider support.

Conclusion: Patients at two military treatment hospitals reported high levels of satisfaction with a novel 10-day intensive remote monitoring assessment including a mobile health assessment and wrist-wearable device. Future studies should evaluate the clinical and economic impact of sleep telehealth and remote monitoring in the U.S. military.

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Abstract citation ID: zsad077.0279

0279**SLEEP HYGIENE FOR SLEEP HEALTH IN THE GENERAL POPULATION: WHAT DOES DATA FROM CONSUMER SLEEP TECHNOLOGY TELL US?***Elie Gottlieb¹, Luke Gahan¹, Samantha Wilson¹, Nathaniel F. Watson², Roy Raymann¹*¹ SleepScore Labs, ² University of Washington

Introduction: Despite being used and widely recommended since the 1970s, few studies have examined whether adherence to sleep hygiene practices affect objectively measured sleep in non-clinical populations. While individual components of sleep hygiene such as limiting caffeine and alcohol consumption are clearly related to sleep by plausible physiological and psychosocial mechanisms, the real-world evidence of overall sleep hygiene practices on sleep is surprisingly inconsistent. Here, we examined the association between self-reported sleep hygiene practices and objectively measured sleep in a general population.

Methods: Responses to a survey on sleep hygiene were used and matched with objective sleep data, resulting in data from 720 users (mean age: 52.5 ± 15.9, 63.4% female). Objective sleep data across 92,808 nights were included in the analysis from the PSG-validated SleepScore Mobile Application, which uses a non-contact sonar-based method to capture sleep-related metrics and self-reported lifestyle. Self-reported sleep hygiene practices were assessed with 13-items on a 5-point scale ranging from “Never” to “Always”. Descriptive statistics and linear regressions were used for the analysis, controlling for age and gender.

Results: Overall, the top three most frequented poor sleep hygiene practices were going to bed at different times (29.7%), overthinking/worrying in bed (24.0%), and waking at different times (22.7%). Linear regressions revealed a significant negative association between composite sleep hygiene scores and objective sleep measures, whereby poorer sleep hygiene was associated with significant reductions in total sleep time ($\beta = -0.89$, $SE = 0.33$, $p < 0.01$), REM duration ($\beta = -0.24$, $SE = 0.10$, $p < 0.05$), and SleepScore ($\beta = -0.15$, $SE = 0.05$, $p < 0.01$), an objective sleep quality metric. No significant associations were observed between individual sleep hygiene factors and objectively measured sleep.

Conclusion: While we could not identify a relationship between individual hygiene factors and sleep, poorer aggregated sleep hygiene scores were associated with poorer objectively measured sleep. Thus, sleep health may not be defined by one single behavior, but rather by the sum of its parts. Future work should examine the efficacy of personalized sleep hygiene factors in sub-clinical populations, where targeted sleep hygiene education may be preferred given it is more intuitive and less burdensome than other behavioral interventions.

Support (if any): SleepScore Labs

Abstract citation ID: zsad077.0280

0280**UNLOCKING THE POTENTIAL OF CONSUMER WEARABLES FOR PREDICTING SLEEP IN CHILDREN: A DEVICE-AGNOSTIC MACHINE LEARNING APPROACH.***Xiangyu Hu¹, Hongpeng Yang¹, James White¹, Srihari Nelakuditi¹, Rahul Ghosal¹, Yan Tong¹, Glenn Weaver¹, Olivia Finnegan¹*¹ University of South Carolina

Introduction: Consumer wearables use accelerometry and heart rate to predict sleep, the same data signals used by research-grade devices to classify sleep/wake patterns. However, metrics predicted by consumer wearables are based on black box algorithms limiting their use in research. The objective of this study was to develop algorithms for predicting sleep in children based on the raw accelerometry and heart rate data from a popular consumer wearable device, therefore bypassing the onboard black box algorithms.

Methods: 38 children (M=8.5 years, SD=2.4, 42% black, 61% male) underwent overnight laboratory-based polysomnography (PSG) while wearing an Apple Watch Series 7. Heart rate and accelerometry data were collected via the Apple Watch application program interface. Features extracted included (1) age, (2) heart rate, (3) y-axis offset angle, (4) y-axis angle relative to x-axis (y-angle), (5) x-axis fast Fourier transformation (FFT) 4Hz, (6) x-axis FFT 9Hz, (7) vector magnitude (VM) FFT 9Hz, (8) VM FFT 14Hz, (9) mean power dispersion (MPD), (10) bandpass filter followed by Euclidean norm/vector magnitude (BFEN), (11) dominant signal power at 0.6–2.5Hz (PMAXBAND), and (12) activity counts. Four machine learning models: logistic regression (LR), K-nearest neighbor (KNN), random forest (RF), and neural network (NN) predicted sleep or wake. Model performance was evaluated by F1 score, precision, sensitivity, and specificity. Feature importance was evaluated using the RF model.

Results: LR achieved the best performance according to F1 score (RF: 85.04, LR: 86.50, KNN: 82.52, NN: 85.13). LR also had the highest precision (RF:88.33, LR:88.94, KNN: 86.77, NN:87.95), and nearly the highest sensitivity (RF:84.52, LR:86.11, KNN:84.73, NN:86.55) and specificity (RF:75.72, LR:75.00, KNN:54.01, NN:60.57). BFEN was the most important feature, followed by MPD, age, PMAXBAND, VM FFT 14Hz, x-axis FFT 9Hz, heart rate, y-axis offset angle, y-angle, activity count, VM FFT 9Hz, x-axis FFT 4Hz.

Conclusion: Raw accelerometry data combined with heart rate data from the Apple Watch Series 7 was able to detect sleep and wake in children. Leveraging the raw accelerometry data is a viable alternative to relying on black-box algorithms for sleep classification in consumer wearable devices.

Support (if any):

Abstract citation ID: zsad077.0281

0281**AN ASSESSMENT OF THE AGREEMENT BETWEEN SLEEP DIARY AND ACTIGRAPHY IN FIREFIGHTERS**Logan McGoldrick-Ruth¹, Ryan Marmis¹, Monica Kelly², Patricia Haynes¹¹ University of Arizona, ² VA Geriatric Research, Education, and Clinical Center, VA Greater Los Angeles Healthcare System

Introduction: Sleep disruption is a common complaint for firefighters, largely thought to emanate from work and personal demands that prohibit recovery sleep. These disruptions increase the risk of sleep disorders, cardiovascular disease, cancer, and other disorders. Given the significance of sleep on health and the high frequency of sleep disruption in the fire service, we sought to examine the concordance between actigraphic and daily diary sleep assessments. The purpose of this analysis was to contribute information on the use of actigraphy and sleep diaries in shift workers individuals prone to insufficient sleep.

Methods: The sleep of 60 firefighters (n = 329 observations) working 24-hour shifts was assessed on a 6-day recovery period. Objective sleep was assessed via the Actiwatch-2, a research-grade, wrist-worn actigraph that measures motor activity in 30 sec intervals. Subjective sleep was assessed via the research consensus daily sleep diary, a self-reported measure collected upon awakening. Major sleep indices compared were: sleep onset latency (SOL), total sleep time (TST), sleep efficiency (SE), and wake time after sleep onset (WASO).

Results: Repeated effects Bland-Altman analysis using a mixed effects technique (measurement = fixed effect; participant = random effect) found that firefighters underestimated WASO (M = 32 min) and overestimated SE (M = 10%) at a level greater than the a priori clinical significance thresholds set by the American Academy of Sleep Medicine for insomnia. The limits of agreement for all sleep indices were very broad. For instance, 95% of the differences between self-report and actigraphic TST fell within a 4.7h range. The majority of the variability could be attributed to within-subject sources of variability versus between-subject sources of variability.

Conclusion: In firefighters, actigraphy and sleep diaries showed substantial disagreement in major sleep indices, with a systematic underestimation of WASO and overestimation of SE. The wide range of differences suggest that daily assessments of SOL, WASO, SE, or TST in on-call shift workers should be compared against a feasible gold-standard. Further research is needed to understand within-subject factors (e.g., daily differences) that predict a discrepancy between actigraphic and self-reported sleep in different working populations.

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Abstract citation ID: zsad077.0282

0282**BEHAVIORAL-SOCIAL RHYTHMS AND METABOLIC SYNDROME PREVALENCE IN RETIRED NIGHT SHIFT AND DAY WORKERS**Eunjin Tracy¹, Brian Chin², H. Matthew Lehrer¹, Brant Hasler³, Mark Thomas¹, Stephen Smagula¹, Sarah Kimutis¹, Martica Hall¹, Daniel Buysse⁴¹ University of Pittsburgh, ² Trinity College, ³ University of Pittsburgh Department of Psychiatry, ⁴ University of Pittsburgh Medical Center

Introduction: Disrupted sleep and circadian rhythms, such as those occurring during night shift work, are established cardiovascular disease (CVD) risk factors like hypertension, obesity, and insulin resistance. However, we do not know whether the effects of shift work on CVD risk factors persist into retirement. Conversely, regularity in behavioral-social rhythms – the systematic patterning or timing of daily routines like work/housework, sleeping, eating and social interactions – may keep endogenous circadian rhythms synchronized to the 24-hour day and reduce CVD risk. This study examined: 1) whether behavioral-social rhythms are associated with a major CVD risk factor, prevalent metabolic syndrome, in retired night shift workers and day workers; and 2) whether past night shift work exposure moderates the associations between behavioral-social rhythm and metabolic syndrome prevalence.

Methods: Participants were 71 retired night shift workers (39 women (54.9%), 32 men (45.1%)) and 83 retired day workers (46 women (55.4%), 37 men (44.6%)), with mean age 68.4 (5.4) years. Logistic regression models were used to examine associations between behavioral-social rhythms and metabolic syndrome prevalence. Independent variables included Social Rhythm Metric-5 (SRM5; a 5-item scale to quantify rhythms of daily life) score and actigraphy rest-activity rhythm inter-daily stability (IS; rhythm stability across days) and intra-daily variability (IV; rhythm fragmentation within days). The dependent variable was metabolic syndrome prevalence.

Results: More regular behavioral-social rhythms were associated with lower odds of having metabolic syndrome (SRM5: OR=0.57, 95%CI [0.35, 0.88]; IV (Higher score means lower regularity): OR=2.05, 95%CI [1.23, 3.44]). In addition, more regular behavioral-social rhythms were associated with lower odds of having two individual components of metabolic syndrome, body mass index (SRM5: OR=0.56, 95%CI [0.37, 0.85]; IV: OR=2.05, 95%CI [1.30, 3.23]) and high-density lipoprotein cholesterol level (SRM5: OR=0.49, 95%CI [0.30, 0.80]; IV: OR=1.78, 95%CI [1.06, 2.98]). Shift work exposure did not moderate the association between behavioral-social rhythms and metabolic syndrome prevalence.

Conclusion: Behavioral-social rhythms are related to metabolic syndrome prevalence in retired adults regardless of prior shift work exposure. Older retired workers may benefit from interventions that promote behavioral-social rhythm regularity.

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0283**FIREFIGHTERS' SLEEP CHANGES AFTER SWITCHING SHIFT SCHEDULES: A LONGITUDINAL STUDY**Joel Billings¹¹ Embry-Riddle Aeronautical University

Introduction: In the past few years, fire departments in the US have been switching from 24 hours on / 48 hours off (24/48) shift schedule to the 48 hours on / 96 hours off (48/96) shift schedule to increase recruitment and reduce commute frequency for members living outside the jurisdiction. While firefighters at work may be able to rest and sleep when not otherwise busy, it is not

a guarantee and concerns on health and safety understandably exist when subject to 48 hours on shift. Yet, it is unclear how switching schedules influence firefighters' sleep. Therefore, the objective of this research is to assess sleep before and after firefighters transitioned from the 24/48 to the 48/96 shift schedule.

Methods: A pre-experimental, within-subjects, longitudinal sleep study was implemented with a Southcentral US fire department (n=24). Daily sleep included total sleep time (TST), sleep efficiency (SE), sleep latency (SL), and wake after sleep onset (WASO), and was assessed using wrist actigraphy and the Emergency Services Sleep Diary. Participants completed three, 18-day rounds of data collection: baseline assessment was conducted on the 24/48 and post assessments were conducted after three and six months following the transition to the 48/96.

Results: The results of separate one-way repeated measures ANOVA indicated a statistically significant difference in TST ($F(2,46) = 4.58, p < 0.05$), SE ($F(2,46) = 7.97, p < 0.01$), SL ($F(2,46) = 6.88, p < 0.05$), and WASO ($F(2,46) = 5.58, p < 0.05$) as firefighters transitioned schedules. Post-hoc analysis identified statistically significant pairs between the 24/48 and the three-month post assessment for each sleep parameter: TST (6.4h vs 6.8h), SL (85% vs 89%), SL (8.7min vs 4.9min), and WASO (58min vs 45min).

Conclusion: Firefighters reported an improvement in sleep three months after transitioning to the 48/96. The results suggest that improved sleep on the 48/96 may be related to consolidating work shifts, which reduces the frequency of experiencing advance sleep offset on commute days and allows a greater recovery period at home. While further research is needed to assess how health and performance outcomes are related to firefighter schedules, the findings suggest that the pattern of work and non-workshifts influences sleep.

Support (if any):

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0284

SLEEP HEALTH IN LATINO DAY LABORERS: OCCUPATIONAL HEALTH AND WELLBEING

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Introduction: Little is known about the sleep health of Latin(x) day laborers. Existing research demonstrates that they experience precarious employment, low wages, and hazardous working conditions. Recent studies also show that periods of unemployment and psychosocial stressors, such as financial insecurity, have been associated with worsened mental health outcomes and poor sleep health. Our investigation brings these insights together in order to understand how sleep health impacts well-being in the workplace and how precarious work, such as day labor, impacts sleep, contributing to health disparities.

Methods: This was a mixed-methods study in which twenty participants were recruited using purposive sampling from a worker center run by the Austin Public Health Department and an informal hiring site. Participants were male, over 18 years of age, of Latin(x) ethnicity, who reported problems with sleep. All completed a semi-structured interview with validated sleep

questionnaires. Interviews were audio-recorded, transcribed, and thematically coded.

Results: Most workers were between 30 - 44 years of age, of Mexican ethnicity, and worked in construction. Workers reported poor sleep quality with an average of 5.6 hours of sleep at night. Eighty-five percent (n=17) had problems with either clinically significant insomnia (Insomnia Severity Index ≥ 15), daytime sleepiness (Epworth Sleepiness Scale ≥ 10), or both. In addition, 50% reported either moderate or severe anxiety or depression. Most agreed (80%) that poor sleep affected their quality of life. Regarding work performance, 50% found themselves not concentrating enough on their work two or more times a week. Common themes included: (1) lack of routine and unpredictability of work schedule (2) poor sleep habits and coping mechanisms (3) negative impact of fatigue on work routine and relationships (4) belief that sleep would improve unaided and (5) willingness to seek behavioral health interventions for sleep concerns.

Conclusion: Our results indicate that study participants experience short sleep duration and insomnia in conjunction with high levels of anxiety and/or depression. Participants linked these with unpredictable work schedules, stress, and financial difficulties. However, many were interested in receiving a clinical behavioral intervention to improve their sleep.

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0285

SLEEP HEALTH IN VETERAN POPULATION WITH AND WITHOUT MILD TRAUMATIC BRAIN INJURY

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Introduction: Sleep duration is frequently observed in military and Veteran populations. Some of this effect may result from exposure to traumatic brain injury (TBI) during military service. However, other features of combat deployment, circadian disruption, and chronic stress may contribute to poor sleep independent of the effects of TBI. In this study we tested whether combat deployment with or without TBI exposure was associated with poor sleep compared to civilian controls.

Methods: In a prospective study of Operation Enduring Freedom/Iraqi Freedom/ New Dawn Veterans with repeated blast mild TBI (mTBI) conducted at the VA Puget Sound Healthcare System, self-reported sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI). Age-matched civilians (CONciv) non-TBI deployed Veterans (CONdep) were included in the study for comparison. The outcomes of interest included the PSQI sum score and its key components scored as 0-3. One way ANOVA and paired comparison with Bonferroni adjustment for each component were performed.

Results: A total of 104 mTBI, 36 CONdep and 15 CONciv participants were included. Poor overall sleep quality (PSQI sum>5) was most frequently reported by mTBI participants, followed by CONdep and CONciv participants (80 % vs. 50 vs. 11, $p < 0.0001$). Across virtually every sleep feature, sleep impairment was most pronounced in mTBI participants

followed by CONdep: PSQI sum (mTBI VS. CONdep vs. CONvic= 11.6 vs. 6.5 vs. 3, $p < 0.0001$), sleep duration (5.5 hrs vs. 6.6 vs. 7.1, $p < 0.0001$), sleep onset insomnia (2.1 vs. 1.3 vs. 0.3, $p < 0.0001$), sleep maintenance insomnia (2.5 vs. 1.4 vs. 0.7, $p < 0.0001$), daytime sleepiness (1.3 vs. 0.6 vs. 0.4, $p < 0.0001$), daytime function (1.8 vs. 0.9 vs. 0.3, $p < 0.0001$) and sleep disturbance by pain (1.5 vs. 0.7 vs. 0.1, $p < 0.0001$). Both mTBI and CONdep groups had significantly worse sleep quality than the CONvic group.

Conclusion: Veterans with repetitive mTBI exhibited overall poor sleep quality and impaired sleep in multiple sleep domains. Deployed Veterans without TBI, but exhibited similar, but less severe sleep disruption. Future studies should explore how poor sleep quality may be related to the long-term effects of TBI and military deployment.

Support (if any):

Abstract citation ID: zsad077.0286

0286

YOURS, MINE, OR OURS? EXPLORING SLEEP HYGIENE CONCORDANCE IN MIXED-GENDER, BED-SHARING COUPLE RELATIONSHIPS

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Introduction: Despite research exploring sleep concordance between partners in couple relationships, some variability exists between partners' sleep quality because of the social and relational context. One such mechanism that may help to explain the variability is sleep hygiene and if couples are similar or different in their sleep hygiene and if or how these similarities or differences predict worse sleep, relational, and psychological health. The present study explored the similarities and differences in sleep hygiene and associations with sleep, psychological, and relational health outcomes in 143 mixed-gender, bedsharing couples.

Methods: Paired samples t tests between partners were conducted using the total Sleep Hygiene Index scores (aim 1a), and at the individual-item level (aim 1b). Intraclass Correlation Coefficient (ICC) scores of dyadic reports were conducted to examine the level of agreement between each partner's sleep hygiene (aim 1c). Finally, a dyadic score model was examined using Structural Equation Modeling to identify associations between both a between-partner difference in sleep hygiene score and within-couple sleep hygiene average score on individual sleep quality, couple conflict frequency, and individual emotional distress.

Results: Results revealed a significant difference between men ($M = 14.45$, $S.D. = 7.41$) and women's total score self-report sleep hygiene ($(M = 17.67$, $S.D. = 8.27)$; $t(142) = -5.06$, $p < .001$). Further, partners only had similar sleep hygiene for 5 out of the 13 items. Partners' had moderate agreement on sleep hygiene (.69-.856), suggesting that partners largely know each others' sleep hygiene habits. Finally, lower within-couple sleep hygiene was linked with both partners' worse sleep outcomes, more relational conflict, and higher emotional distress.

Conclusion: Findings from this study suggest that couples are less concordant in sleep hygiene practices than sleep quality. Moreover, partners are relatively aware of each other's sleep hygiene which may in part be associated with their psychological and relational functioning. Differences between partners seemed to be less impactful than the couples' average sleep hygiene on sleep, relational and psychological well-being outcomes. These results suggest that couple-level intervention on sleep hygiene

may benefit both partners and carry over into relational and psychological benefits.

Support (if any):

Abstract citation ID: zsad077.0287

0287

HUMANS ARE CAPABLE OF ACHIEVING SUFFICIENT SLEEP IN MICROGRAVITY

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Introduction: Studies consistently find that humans average approximately six hours of sleep per night in space, which is less than they sleep on Earth. It is unclear whether the sleep loss observed during spaceflight is related to modifiable factors, such as irregular scheduling and inadequate sleep environment or due to features of spaceflight that may alter physiology, such as microgravity. Recent missions have afforded crew better, more stable sleep schedules, and an improved sleep environment. Hence, the evaluation of sleep under these improved conditions should provide insight into the causes of sleep deficiency observed in space thus far.

Methods: Crewmembers ($n = 19$) wore actiwatchers for two bouts of data collection lasting two weeks each before flight (at approximately L-270 and L-180), either continuously ($n = 9$) or for two weeks every two months while in space ($n = 10$), and for seven days postflight, immediately upon return to Earth. We compared sleep outcomes (sleep duration, wake after sleep onset [WASO], sleep efficiency, and sleep latency) between phases of flight using mixed effects models, with participant and intercept included as a random effect.

Results: Crewmembers averaged 7.3 +/- 0.4 hours of sleep per night in space. Though this was less than they achieved preflight (7.9 +/- 0.5) or postflight (7.8 +/- 0.8; $F(2, 2866) = 86.26$, $p < .0001$, $\eta^2 = .06$), this duration of sleep meets the recommended amount for optimal human health and well-being. Sleep efficiency (%) also increased inflight (88.7 +/- 2.7) compared to preflight (84.7 +/- 5.5) and postflight (84.4 +/- 6.1; $F(2, 2630) = 124.08$, $p < .0001$, $\eta^2 = .09$), while WASO (min) decreased inflight (29.6 +/- 8.2) compared to preflight (46.4 +/- 15.5) and postflight (48.7 +/- 16.0; $F(2, 2629) = 285.90$, $p < .0001$, $\eta^2 = .18$). There were no changes across these variables over time inflight.

Conclusion: We conclude that humans are capable of achieving sufficient sleep in space. Going forward, it is imperative that crewmembers are provided with stable schedules, with moderate workload, and environments that are conducive to sleep.

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0288

MULTIDIMENSIONAL SLEEP HEALTH AND COGNITIVE FUNCTION IN RETIRED NIGHT SHIFT WORKERS AND RETIRED DAY WORKERS

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Introduction: Night shift work is associated with compromised cognitive function, and with chronic exposure, may place shift

workers at elevated risk for dementia. Given that former night shift workers experienced prior long-term sleep and circadian rhythm disruption, their sleep in retirement—after returning to a daytime schedule—may be particularly salient for cognitive function. This study examined associations between multidimensional sleep health and neurocognitive function among retired night shift workers and retired day workers.

Methods: Participants (N = 61; mean age: 67.9 +/- 4.7 years; 61% females; 13% non-Hispanic White) were 31 RDW and 30 RNSW equated on age, sex, race/ethnicity, premorbid IQ, and years in retirement. Multidimensional sleep health was quantified using wrist actigraphy measures of sleep efficiency, timing, duration, and regularity, and diary measures of alertness and satisfaction. Each component was dichotomized and summed to create a composite score (0-6); higher values indicated better sleep health. Participants completed a neurocognitive battery assessing six cognitive domains (language, visuospatial ability, attention, immediate and delayed memory, executive function) and self-reported cognitive function. Linear regression models tested associations of multidimensional sleep health and its individual components with cognitive domains in each group, adjusting for age, sex, and education.

Results: Retired night shift workers and retired day workers did not differ on multidimensional sleep health or its individual components. Among retired night shift workers, poorer multidimensional sleep health was associated with poorer self-reported global cognitive function (beta = 0.51, p = .018), and more irregular sleep timing was associated with poorer self-reported memory (beta = 0.41, p = .054). Multidimensional sleep health and its individual components were unrelated to cognitive function in retired day workers.

Conclusion: Retired night shift workers may be cognitively vulnerable to poor sleep health in retirement, possibly due to a history of long-term sleep and circadian rhythm disruption while working. Given that self-reported cognitive difficulties often precede more objective cognitive changes, future research should determine whether associations of sleep health with cognitive function are found in more objective cognitive measures as retired night shift workers age.

Support (if any): R01AG047139, R01AG047139-S1, K01A G075171

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0289

A PICTURE ON THE SLEEP OF THE PORTUGUESE HEALTH SYSTEM: PRELIMINARY FINDINGS OF A WORK IN PROGRESS

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Introduction: Sleep difficulties are commonly referred by health care workers that can affect quality of life and productivity, both in patients and healthy individuals. This study firstly aimed to evaluate sleep quality in distinct groups of health care workers as well as the impact of shift work and health related habits on the sleep of such professionals.

Methods: This prospective, cross sectional, observational study involved health care workers (Physicians, Residents, Nurse Staff, Psychologists and Therapeutic and Diagnostic Technicians - TDT) from the Portuguese Health System (public or private)

aged from 25 and 65 years old. A General Health Survey was followed by Standard validated sleep questionnaires for assessment of sleep quality (Pittsburgh Sleep Quality Index - PSQI), insomnia (Insomnia Severity Index - ISI), risk of obstructive sleep apnea (STOP-BANG), and excessive daytime sleepiness (Epworth Sleepiness Scale - ESS).

Results: From the pretended pool of 425 health care workers to whom questionnaires were sent, 160 (131: 81.9% females) responded (37.7% of response rate). From those, 30% of those professionals were Residents, 30.6% were TDT, 21.9% Physicians, 10.6% Nurses, and 6.9% Psychologists. 46.5% assumed itself with a morning-type profile whereas 39.5% were intermedium and 14% evening-type persons. From the global sample, 62.5% had poor sleep quality with 37.5% in the insomnia threshold whereas 14.4% presented with either moderate or severe forms of insomnia. Regarding the risk for sleep disordered breathing, 6.5% were at high risk for Obstructive Sleep Apnea - OSA, and 15.6% complained from mild to moderately forms of excessive sleepiness (ESS>10). In this sample, psychologists achieved the better sleep quality scores while nurses had the poorest scores for the same parameter.

Conclusion: This preliminary findings on the sleep of the portuguese health care workers, suggest that such professionals experience a poor sleep quality in general with a prevalence of major sleep disorders similar to the general population. Although the majority seemed to deny a significant degree of daytime sleepiness, those within a shift work regimen are likely to perform worse.

Support (if any):

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0290

AMBULATORY BLOOD PRESSURE MONITORING DOES NOT REDUCE THE SLEEP OF OFF-DUTY FIREFIGHTERS

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Introduction: Ambulatory blood pressure monitoring (ABPM) across 24 hours is recommended to confirm hypertension and, outside of a laboratory setting, is the only means to measure the extent of any nocturnal decrease in blood pressure (BP) i.e., nocturnal BP dipping. The ambulatory device is traditionally programmed to inflate every 20-30 minutes during awake and sleep. Despite diagnostic benefits, ABPM may disturb sleep and lead to reduced compliance in some individuals. Firefighters, an occupational group with a greater risk of developing cardiovascular disease, often note continued vigilance during sleep, possibly reflecting light sleep and/or frequent awakenings. This potential sleep disturbance may contribute to firefighters' cardiovascular disease risk and may also impact ABPM data.

Methods: To assess the effect of ABPM on total sleep time (TST) and wake after sleep onset (WASO) in firefighters, we measured sleep using wrist actigraphy in 120 firefighters (91.3% male) from two different departments in Oregon. As part of a larger longitudinal study, participants' sleep off-shift (as noted from daily survey) was recorded for up to 14 days at two different time points, two months apart. During two consecutive days off, participants completed 24-48 hours of ABPM with simultaneous actigraphy.

Overall, there were 1273 measures of sleep, 206 with the cuff and 1067 without the cuff. Separate mixed models with cuff (on/off) as a fixed effect and participant as a random effect, were run for TST and WASO. Models were adjusted for total time in bed, department, and collection interval.

Results: Surprisingly, TST with the cuff on was significantly greater than nights without the cuff (marginal mean $\pm$ SE: 432.0 $\pm$ 3.1 vs. 415.9 $\pm$ 1.7 minutes respectively, $p < 0.001$). Increased TST was attributable to a lower WASO with the cuff than without the cuff (43.8 $\pm$ 2.9 vs 59.8 $\pm$ 1.7 minutes, respectively, $p < 0.001$).

Conclusion: Contrary to our expectations, ABPM was not associated with actigraphy measured disturbed sleep among firefighters. In fact, in these data, sleep appeared to be improved while wearing the cuff. Perhaps concerns around poor sleep when wearing the device may have led to improved sleep behaviors on those nights, but this hypothesis needs further investigation.

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0291

ATTENDING PHYSICIAN PERCEPTIONS OF NIGHTSHIFT WORK IN THE ICU: RESULTS FROM A LARGE TERTIARY MEDICAL CENTER

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Introduction: Nightshifts represent a substantial proportion of time dedicated to working in the inpatient setting, particularly among ICU staff. Our institution implemented a 24/7 in-person ICU attending model more than a decade ago. With practice growth and more than 200 ICU beds across disciplines, there are now at least 8 ICU attendings in-hospital all night. Yet, little is known about attending staff perceptions and desires about night work, so we began an exploratory analysis.

Methods: An online survey of 13 multiple-choice, slider scale, and open-ended questions were sent via email to critical care staff physicians of different disciplines within our institution.

Results: 69 out of 150 physicians completed the survey (46% response rate). Half were between 35 and 45 years old; 29% were age 45 to 55 years old. About half self-identified as a morningness chronotype. Most (84%) work 3- or 4-night shifts consecutively. Most viewed night shift work as having a negative influence on their quality of life (48% "somewhat negative" and 22% "very negative") and on their health (51% "somewhat negative" and 24% "very negative"). Most would choose to work less nightshifts (37%) or none (29%). During nightshift assignments, about half (53%) self-report an average of 5 hours of sleep per 24-hour period; 18% self-report $\leq$ 4 hours. Only 6% reported 7 or 8 hours of sleep. Mitigating strategies utilized during series of night shifts include use of caffeine (78%), naps (66%) and use of sleeping aids (21%). Outside of the nightshift series, more than half (56%) reported no sleep difficulties while 21% reported onset or maintenance insomnia.

Conclusion: At our large tertiary hospital employing an in-house nightshift model across multiple ICUs, most staff ICU physicians have a negative perception of night shift work on their quality of life and health. The majority of respondents would choose to work less or no night shifts. How self-reports of limited sleep (average 5 hours) per 24-hour period compare to objectively measured sleep duration in this population remains to be determined in the next phase of this study.

Support (if any):

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0292

DEVELOPMENT AND VALIDATION OF THE SLEEP CONFLICT SCALE IN COUPLE RELATIONSHIPS

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Introduction: Although there is considerable sleep concordance between partners in couple relationships, less is known about sleep practices between them and if there is conflict around sleep habits, preferences, and behaviors. Past empirical work suggests that couples who share the same sleep-wake preferences (i.e., morning vs. night people) report higher marital adjustment and less relational conflict. And yet the mechanism through which this occurs is yet unknown. One such mechanism is sleep-related conflict whereby partners disagree about their partners' sleep rituals causing sleep-related conflict.

Methods: The present study utilizes two samples to validate the Sleep Conflict Scale (SCS), one in individuals in relationships and the other sample of paired partners (dyadic data). The sleep conflict scale is a 5-item measure and includes items such as "My partner and I disagree about sleep routines and habits" and "Our relationship is negatively affected by our sleep differences". In order to identify the underlying factor structure of the SCS, several criteria was assessed to determine suitability for factor analysis, including bivariate correlations, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy, and Bartlett's test of Sphericity. Composite scores were computed and internal consistency was assessed by conducting Cronbach Alpha reliability estimates. We tested convergent validity by identifying associations between the SCS and relational and psychological health measures. Finally, using the dyadic sample, we also tested a structural equation model using the SCS on both partners' sleep hygiene and sleep quality.

Results: Results revealed that the SCS fit a one factor solution of five items and that a summed or mean score can be used. The SCS demonstrated excellent internal reliability and external validity when compared to other relational and psychological measures. Finally, higher sleep conflict was associated with worse sleep hygiene and poorer sleep quality for both partners.

Conclusion: The analyses provided support that the SCS scale is a psychometrically sound measure, in that it demonstrates a single factor structure, is highly reliability, and is qualitatively different than other couple or sleep-related measures. The SCS can be used in both primary and secondary care settings to identify couples who would benefit from relational intervention especially when sleep adherence is low.

Support (if any):

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0293

SLEEP HEALTH IN AMERICA: UPDATE FROM THE NATIONAL SLEEP FOUNDATION'S 2022 SLEEP HEALTH INDEX®

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Introduction: Sleep is a crucial measure of health and well-being. Individuals with good sleep health tend to have better physical, emotional, cognitive, and social functioning than individuals with poor sleep health. The National Sleep Foundation developed the Sleep Health Index® (SHI) in 2016 as a means

to monitor the sleep health of the general population. Since its inception, the National Sleep Foundation has administered the SHI annually to a representative sample of the US population. This study reports on the 2022 SHI and examines US population trends in sleep health from 2019 through 2022.

Methods: The SHI is a valid, reliable measure consisting of 16 questions related to the three discrete constructs of sleep duration, sleep quality, and disordered sleep. In 2022, the SHI was administered to a nationally representative, random sample of 1,042 Americans via the probability-based Ipsos KnowledgePanel®, in which panelists complete surveys online in English or Spanish. Results have a margin of sampling error of 3.2 points. We examined sleep health trends from 2019 through 2022 and examined whether sleep health in 2022 differed from previous years. Group differences in sleep health were also investigated.

Results: Americans' average SHI score in 2022 was 75 (on a 0–100 scale), which is consistent with SHI scores observed in previous years. The SHI total score was statistically highest among college graduates, Hispanic adults, and people with household incomes of \$100,000+ a year and statistically lowest among those with household incomes less than \$50,000. Despite stable SHI total scores, there were statistically significant declines in both average weekday sleep scores (76 in 2021 to 71 in 2022) and in sleep deficit scores (86 in 2021 to 82 in 2022), which are based on the difference between weekday sleep and the amount of sleep respondents say they need to be well-rested and feel their best.

Conclusion: While overall sleep health remained stable, weekday sleep duration and sleep deficit worsened considerably as pandemic-related restrictions came to an end. The sociocultural and political contexts in which sleep health occurs, as well as associated features, like mental and physical health, deserve further consideration.

Support (if any):

Abstract citation ID: zsad077.0294

0294

SLEEP QUALITY RATINGS PREDICT DISAGREEMENT BETWEEN DAILY OBJECTIVE AND SUBJECTIVE EVALUATIONS OF TOTAL SLEEP TIME IN FIREFIGHTERS

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Introduction: Accurate sleep assessment in firefighters is necessary to predict risk for error and also to identify sleep disorders like shift work disorder. Unfortunately, the primary tools for sleep assessment, actigraphy and sleep diaries, are sometimes discordant leaving interpretation of sleep unclear. This analysis sought to examine determinants of daily discrepancies between actigraphy and sleep diaries in firefighters to further understand the validity of these measures in an on-call, high risk occupation.

Methods: Daily sleep observations (n = 329) were collected from 60 firefighters over the course of a 6-day recovery period after working 5 non-consecutive 24-hour shifts (5/6 tour). Firefighter subjective sleep was measured using the consensus sleep diary, and objective sleep was measured via wrist-worn actigraphy (Actiwatch-2). Mixed linear modeling (MLM) was employed with purposeful selection of covariates to test which day-level variables (day of recovery, emotional state, sleep quality rating) and person-level variables (burnout, age, gender, minority status)

best predicted disagreement in total sleep time (TST) between the sleep diary and actigraphy.

Results: The best-fitting model indicated that TST incongruity (subjective > objective) occurred on days when individuals reported better sleep quality than their own average (Estimate = 19.87, SE = 5.02, p < .001), more feelings of restfulness than their own average (Estimate = 22.70, SE = 4.77, p < .001), less objective TST than their average (Estimate = -.37, SE = .04, p < .001) and for persons with higher duration subjective TST (Estimate = 1.02, SE = .07) and lower duration objective TST (Estimate = -1.00, SE = .08, p < .001). Neither burnout nor daily emotions predicted discrepancies in the two methods of assessment.

Conclusion: Employees most at-risk for potential overestimation of sleep duration were those that habitually received less objective TST or who habitually reported more TST. A discrepancy in measurement occurred on days when employees reported better-than-usual sleep quality and restfulness after sleep. These robust findings demonstrated that positive perception of sleep quality is a potential indicator of sleep overestimation in firefighters. Further research is necessary to examine the short- and long-term consequences of sleep overestimation in this occupation.

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0295

ASSOCIATION BETWEEN CIRCADIAN RHYTHM OF SKIN TEMPERATURE AND ACTIGRAPHIC SLEEP IN FREE-LIVING CONDITIONS: THE HEIJO-KYO STUDY

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Introduction: Skin temperature manipulation with little or no change in core body temperature affects sleep-wake states. However, the significance of 24-hour variation in skin temperature to sleep quality is unclear. We aimed to evaluate whether the circadian rhythm of distal skin temperature (DST) affects sleep quality in free-living conditions and to provide additional evidence about the relationship between thermal input to the skin and sleep-wake states.

Methods: In this cross-sectional study of 2,177 community-dwelling adults (Mean age 68.8 [SD 8.0] years), we measured DST using a temperature logger (Thermochron iButton, Maxim) at 3-minute intervals for seven consecutive days to calculate non-parametric indicators of circadian rhythm: intradaily variability (IV), interdaily stability (IS), and relative amplitude (RA). The participants underwent simultaneous 7-day wrist actigraphy (GT3X-BT, ActiGraph) to measure sleep objectively. The association between non-parametric indicators and 7-day means of sleep measures was evaluated using multivariable linear regression models.

Results: Lower quartiles of IV and higher quartiles of IS and RA were significantly associated with higher sleep efficiency, shorter wake after sleep onset, and longer total sleep time (all p < .001). After adjusting for potential confounders, including physical activity and outdoor temperature, the coefficients for the linear trend of sleep efficiency were -1.07 (95% confidence interval [CI]: -1.45, -0.69), 1.08 (95% CI: 0.75, 1.41), and 1.33 (95% CI: 0.83, 1.84) in IV, IS, and RA, respectively (all p < .001).

Conclusion: Circadian rhythms of DST with higher fluctuation, lower regularity across days, and blunted amplitude were associated with worse sleep quality. Our findings may be applied in thermoregulatory interventions to enhance sleep quality.

Support (if any):

Abstract citation ID: zsad077.0296

0296**FEASIBILITY OF A SLEEP HEALTH INTERVENTION MOBILE APP FOR LONG-TERM SLEEP TRACKING AND USABILITY IN CARGO PILOTS**Jaime Devine¹, Jake Choynowski², Steven Hursh³¹ Institutes for Behavior Resources, INC., ² Institutes for Behavior Resources, ³ Institutes for Behavior Resources, INC

Introduction: Cargo operations frequently require pilots to cross multiple time zones and operate during the night, both of which are fatigue risks. Operators may benefit from an mobile app that provides individual warnings based on prior sleep history. The SleepTank™ mobile app provides warnings about fatigue risk based on the wearer's individual sleep data as measured by Fitbit devices. In this pilot study, 10 cargo operators provided feedback about the accuracy and usability of the app and up to 100 days of continuous sleep data.

Methods: Ten (N=10) experienced cargo pilots from a major operator volunteered to wear a Fitbit Versa 2 or Charge 5 to evaluate the app over three months (June-October 2022). Pilots completed a Qualtrics online survey about their perceptions of the app's accuracy and usability in October 2022. Data for up to 100 days was extracted at the end of the study period. Sleep data was summed by date to provide a 24-hour estimate of time in bed (TIB24), total sleep time (TST24), daily sleep intervals (DSI), and average sleep efficiency (SE). Changes to sleep behavior over time were explored using mixed model linear regression.

Results: Cargo pilots (N=10) wore the device with the app for an average of 69±29 days (Range: 25-100 days). Pilots' TIB24 was 455±111 minutes, TST24 for 400±98 min, and SE was 88±4%. Pilots normally slept once per day (DSI: 1.2±0.5). Pilots' sleep behavior did not change significantly over the study period (all p> 0.4). All 10 rated the app as being useful, particularly for planning bedtimes and naps. 100% of the pilots rated SleepTank™ as accurate in predicting their fatigue levels.

Conclusion: Experienced cargo operators in this pilot study exhibited healthy sleep habits that were stable over the study period. Operators found the app useful and felt that app-provided fatigue ratings matched their perceived level of fatigue. App usage was not directly related to changes in objective sleep behavior but did validate operators' experience of fatigue, which may lead to better identification of fatigue symptoms or proactive sleep planning to avoid periods of fatigue risk in the future.

Support (if any): NA

Abstract citation ID: zsad077.0297

0297**PATHWAYS: A PILOT STUDY EXAMINING THE IMPACT OF NIGHTSHIFT WORK ON OBESITY AND TYPE 2 DIABETES RISK IN FREE-LIVING SHIFT WORKERS**Kevin Clark¹, Joseph Cleveland¹, Elizabeth Holzhausen¹, Zachary Stieneker¹, Joseph Lim¹, William Patterson¹, Gabby Kraemer¹, Josiane Broussard², Celine Vetter¹, Edward Melanson³, Seth Creasy³, Kenneth Wright¹, Tanya Alderete¹

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Introduction: Traditional risk factors for obesity and type 2 diabetes, such as poor diet and low physical activity, cannot fully explain the increased incidence of these diseases. Insufficient sleep and circadian misalignment due to shift work may contribute, in part, to this epidemic through their growing prevalence and associated impaired glucose regulation and eating out of phase.

Methods: Female nightshift healthcare workers (n=5) worked ≥2 shifts (~7pm-7am) during the 7-day study. Actigraphy was measured and participants wore continuous glucose monitors and completed three 24-hour dietary recalls. Dim light melatonin onset was predicted (pDLMO) for each worker from an actigraphy derived algorithm validated for shift workers. The timepoints two hours after (pDLMO+2) and 10 hours after (pDLMO+10) predicted DLMO are presented as a range in which sleep typically occurs, on average, relative to DLMO.

Results: Mean participant age was 30.7 years and body mass index 22.8 kg/m². Dietary recalls report the average total energy consumed on workdays to be 1,653 kcal ± 444 (mean ± SD) compared to 1,517 kcal ± 421 on free days (p=0.64). Average eating windows were 13.88 ± 2.69 hours on nightshifts compared to 9.88 ± 1.82 hours on workfree days (p=0.051, n=4 one individual did not report eating while on shift). Further, eating occasions between 10pm-7:30am were only reported on worknights. Average pDLMO was 23.26 ± 1.27 hours, corresponding to the middle of shift. The average interstitial glucose level between pDLMO+2 and pDLMO+10 on shift was 88.4 mg/dL ± 9.0 and the average during the same interval on workfree nights was 81.1 mg/dL ± 7.0 (p = 0.024). Additionally, an increase in 24-hour average glucose was observed on shift 90.9 ± 4.9 compared to free days 86.1 ± 6.2 (p=0.021).

Conclusion: Early results from this ongoing study show that an extended eating window, eating overnight, and/or working overnight contribute to increased glucose levels while night workers are on shift compared to their days off. Increased overnight glucose levels, especially at a time the body may be accustomed to sleeping, represent a time of impaired glucose tolerance and potentially reduced insulin sensitivity.

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0298**ROMANTIC RELATIONSHIPS AND INSOMNIA IN MILITARY SOLDIERS**Nayeli Nunez Cruz¹, Christine So², Katherine Miller², Philip Gehrman¹

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Introduction: Intimate relationships may impact insomnia symptoms. In particular, marriage may serve as a protective factor against the development of insomnia, particularly for men. However, little research has studied how relationship quality may contribute to insomnia, particularly in military populations where social support may be particularly important. Therefore,

this study will examine the associations between indices of relationship quality and insomnia in a sample of Army Soldiers.

Methods: Data were acquired from the All Army Study of the Army Study to Assess Risk and Resilience in Servicemembers (STARRS; N=21,449; mean age= 28.6; 88.24% male). Participants completed a survey that included questions about insomnia symptoms and their social networks. Items assessed marital status, duration of marriage, frequency of disagreements, and relationship quality and happiness. Chi-squared analyses were used to examine the associations between probable insomnia from the past 30 days and relationship items.

Results: Approximately 38.2% of this sample experienced past month insomnia symptoms. Insomnia was more prevalent in divorced or separated individuals. Among partnered individuals, Soldiers who reported that they talked more about ending the relationship and had more disagreements with their partners were more likely to have insomnia symptoms. Conversely, those reporting that their relationships were going well or satisfied in their relationship were more likely to not have insomnia.

Conclusion: In this sample of Soldiers, marriage only served as a protective factor when individuals had a positive outlook in their relationship. These results also suggest that healthier relationships are generally associated with better sleep. These findings underline the importance of relationship quality and its effects on insomnia.

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0299

SLEEP HYGIENE IN NURSES USING DATA COLLECTED FROM CONSUMER SLEEP TECHNOLOGY (CST) WITH THE SLEEPTANK™ MOBILE APP

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Introduction: Nurses are prone to fatigue and sleep disturbances due to extended hour or shiftwork schedules. Fatigue in nurses not only compromises their own health and safety, but jeopardizes patient care as well. Nurses' work hours and overtime are currently not federally regulated. Fatigue risk mitigation strategies for nurses would benefit from understanding the relationship between sleep duration and work patterns in order to develop tools and regulations to protect against fatigue in the nursing profession.

Methods: Thirteen (N=13) nurses wore a Fitbit Versa 2 and used the SleepTank™ mobile app during a 6-week work rotation. Nurses in this study selected their own work shifts but did have duty-hour limitations. Sleep data was extracted via the mobile app; work schedules were self-reported. Sleep duration data was summed by date to provide a 24-hour estimate of time in bed (TIB24). Repeated measures analysis of variance (rmANOVA)

explored differences in TIB24 by number of consecutive days worked and time. Pearson's correlations evaluated the relationship between work and sleep.

Results: Nurses (N=13) wore the device with the app for an average of 54±15 days. Forty percent (40%) of the study period were work days (22±10). Nurses slept longer on non-work days (525±153 min) compared to work days (481±143; t=3.21, p=0.001). Nurses worked 2 days in a row on average (Range: 1-5). TIB24 was ~30 minutes shorter with each consecutive day worked (F5, 81=8.11, η^2 =0.08, p=< 0.001). Routinely working a greater number of consecutive days was negatively correlated to TIB24 (r=0.71, p=0.009). Later average work start time was positively correlated with later bedtime (r=0.83, p< 0.001) and shorter TIB24 (r=0.65, p=0.01).

Conclusion: Working more days consecutively and working later shifts was related to shorter sleep duration and later bedtime in nurses. However, given that nurses in this study routinely slept longer than 7 hours per night, poor sleep hygiene does not appear to be an issue in this population. The ability to select their own work shifts may allow nurses to select a schedule that permits healthy sleep behavior.

Support (if any): N/A

Abstract citation ID: zsad077.0300

0300**A PROSPECTIVE FOLLOW-UP STUDY OF COVID'S EFFECTS ON SLEEP AND COGNITION IN POST-ACUTE PERIOD IN A PRIMARILY MINORITY POPULATION**

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Introduction: Long Covid, the post-acute sequelae of COVID-19, has evolved in recent months into a recognized spectrum of manifestations that persist after acute Covid-19 illness. Despite over 2 years of information since the start of the pandemic, data remains limited on the effect Long Covid may have on sleep and cognition. This study aims to assess the association between COVID-19 infection and sleep impairment in the post-acute period.

Methods: A total of 747 patients were identified from hospitalized COVID-19 patient records at Howard University Hospital between Feb 2020 and May 2021. 285 of these patients were interviewed by the research team 6-12 months after their initial infection. Sleep symptoms were collected via a questionnaire from 125 patients (64% African American, 34% Hispanic) to include the following four data points: difficulty falling asleep, worsened sleep quality, daytime somnolence (since COVID-19 occurrence) and the number of hours of sleep in 24 hours. In addition, a cognitive assessment was also conducted via a Mini-MOCA questionnaire (n=103 patients, 59% African American, 35% Hispanic). Of note, all sleep questionnaire participants did not report pre-COVID-19 sleep issues concerns. We looked for any associations between multiple clinical variables, sleep disturbance, and abnormal MOCA scores using proper statistical methods such as t-tests, chi-square tests, univariate and multivariable logistic regression.

Results: Out of the 285 respondents to the interview, 28 of 125 completing sleep assessments declared sleep disturbance symptoms, and 79 of 103 completing Mini-Moca assessments had an abnormal Mini-MOCA score. Patients with sleep disturbance symptoms were further analyzed and a significant association was identified between sleep disturbance and the following variables: increase in age ($p=0.046$), Diabetes Mellitus diagnosis ($p=0.009$), elevated troponin level on admission ($p<0.05$), ARB use during hospitalization ($p=0.006$), ICU admission during hospitalization ($p<0.05$), and exposure to ECMO ($p=0.011$). Not surprisingly, sleep disturbance had a significant association with reduced total sleeping hours in 24 hr period ($p<0.0001$).

Conclusion: Preliminary findings indicate the presence of sleep disturbance on longitudinal follow-up of patients previously infected with SARS-CoV-2. Additionally, we found a significant association between sleep disturbance in COVID-19 patients with many variables. Larger studies are required to further analyze these associations.

Support (if any):

Abstract citation ID: zsad077.0301

0301**ASSOCIATIONS BETWEEN SLEEP AND COGNITIVE FUNCTION IN PATIENTS WITH NEUROLOGICAL POST-ACUTE SEQUELAE OF SARS-COV-2 INFECTION.**

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Introduction: Fatigue and sleep disturbance are among the most common neurological post-acute sequelae of SARS-CoV-2 infection (Neuro-PASC). We tested the hypothesis that impaired sleep and disrupted rest-activity rhythms are associated with impaired cognitive performance and greater burden of self-reported Neuro-PASC symptoms.

Methods: Forty adults (mean age 45 years, 69% female, 15% hospitalized post COVID) recruited from the Neuro-COVID-19 Clinic at Northwestern Memorial Hospital. Patients were evaluated via clinical assessment/history, chart review, patient reported outcomes for symptom severity (PROMIS cognitive function, fatigue, sleep disturbance, anxiety, depression), cognitive performance tests (NIH Toolbox modules for processing speed, attention, executive function, working memory), and 7 days of wrist actigraphy with a sleep log. We tested associations between objective and subjective measures using Pearson's correlation and difference from population normative data using Student's t test.

Results: 39 participants provided sufficient data for analysis. The median number of discrete neurologic symptoms attributed to PASC was 6 with 87% reporting ≥ 4 neurologic symptoms. Fatigue, insomnia, and depression were common ($\sim 70\%$ reporting each). Participants reported significant symptom burden in all PROMIS domains, and had measurably worse attention function along with borderline executive function, compared to population normative data (all $p<0.001$ except executive cognition $p=0.056$). Actigraphy showed Neuro-PASC patients had lower sleep efficiency and greater sleep latency (both $p<0.001$) but similar wakefulness after sleep onset (WASO) compared to age-matched population controls. Self-reported cognitive symptoms were correlated with severity of fatigue ($p<0.001$), anxiety ($p=0.05$), and depression ($p<0.01$), but not subjective sleep disturbance. There were no associations between actigraphy-measured sleep or rest-activity characteristics and self-reported symptoms. Patients with abnormal sleep characteristics (WASO, sleep efficiency, sleep latency) demonstrated impaired objective attention and executive function.

Conclusion: Neuro-PASC patients presenting to a post-COVID clinic have a significant burden of subjective mental health, sleep, fatigue and cognitive impairment symptoms, along with objectively abnormal cognitive performance and sleep, compared to population controls. Interventions to improve sleep could benefit cognitive performance. Prospective studies including larger populations of patients are needed to fully determine the interplay of sleep/circadian rhythm disruption on the cognitive function and quality of life in patients with PASC.

Support (if any): Center for Circadian and Sleep Medicine

Abstract citation ID: zsad077.0302

0302**IMPACT OF THE COVID-19 PANDEMIC ON THE SLEEP PATTERN OF A BRAZILIAN POPULATION SAMPLE**Allan Porcaccchia¹, Sergio Tufik², Gabriel Pires¹, Andréia Bezerra¹, Sergio Tufik¹, Monica Andersen¹¹ Universidade Federal de São Paulo, ² Instituto do Sono

Introduction: As of late 2019, a new viral variant that causes respiratory infection has concerned humanity: SARS-CoV-2. The following year, the COVID-19 pandemic was declared by the World Health Organization. The spread of the virus across country borders led to the implementation of security measures to contain new infections. The confinement during the pandemic helped to minimize new infections, but it affected people's mental health, including sleep parameters. This study evaluated the impact of the pandemic and social isolation on sleep parameters, including sleep quality and hygiene, in a sample of the Brazilian population.

Methods: An online questionnaire on the Google Docs platform was sent to all participants who agreed to contribute to the study, constituting a convenience sample. The questionnaire consisted of 8 parts: written consent; socio-demographic characteristics; assessment of quarantine status, COVID-19 infection, and other health complaints; general sleep evaluation; Pittsburgh Sleep Quality Index (PSQI); Insomnia Severity Index (ISI); Sleep Hygiene Index (SHI); closing remarks. All questions were presented in Portuguese and participants had to answer them considering 2 different contexts: before and during the pandemic. PSQI and ISI categorical data from the two periods were evaluated using the McNemar-Bowker test. To evaluate the effects of the pandemic on questionnaire scores, sleep efficiency and total sleep duration (TSD), generalized estimating equations models were used. Age and quarantine time were covariates in the model.

Results: The final sample comprised 1,109 individuals. During the pandemic, it was observed an increase in sleep efficiency ($\beta=3.537$; $p=0.002$) and in the TSD ($\beta=29.212$; $p=0.002$). Yet, during the pandemic there was an elevation in the PSQI score ($\beta=4.196$; $p<0.001$) and in the ISI score ($\beta=-6.952$; $p<0.001$). For this last, there was a statistical significance when considering the interaction between life context and gender, in which women during the pandemic had higher ISI scores than men before the pandemic ($\beta=-1.877$; $p<0.001$). A decrease in the SHI score was reported during the pandemic ($\beta=-6.768$; $p<0.001$).

Conclusion: An increase in sleep efficiency, total sleep time and SHI score was reported in the sample during the pandemic, although insomnia symptoms and sleep quality worsened.

Support (if any):

Abstract citation ID: zsad077.0303

0303**INSOMNIA AND MORNING DRINKING DURING THE COVID-19 PANDEMIC: A MEDIATING ROLE OF DEPRESSION**Tyler Watson¹, William Killgore²¹ University of Arizona, ² University of Arizona College of Medicine

Introduction: The COVID-19 pandemic constructed a world of unpredictable cultural and commercial stressors to growing connectivity and proliferating society. A potential relationship

between the aspects of heavy drinking and insomnia during the pandemic has not been analyzed. We hypothesized that there would be a significant correlation between morning drinking and insomnia. However, we also hypothesized that this relationship would be mediated by depression.

Methods: 13,313 individuals across the United States were surveyed ($M=37.19$ years old; $SD \pm 12.375$). Neurocognitive battery assessments including self-report measures of depression, insomnia symptoms, and alcohol use. The variable description for this analysis was (How often during the last year have you needed a first drink in the morning to get yourself going after heavy drinking?) The scoring was based on a five-point scale ((0) never (1) less than monthly (2) monthly (3) weekly (4) daily or almost daily.) Insomnia Severity Index reported symptoms qualify for (0-7 score = no clinical insomnia, 8-14 = subthreshold insomnia, 15-21 = moderate clinical insomnia, and 22-28 = severe clinical insomnia). Participants also completed the PHQ-9 Depression Scale.

Results: Morning drinking scores correlated with insomnia ($r=.254$, $p<.001$) and depression ($r=.344$, $p<.001$). A mediation model revealed a total effect of insomnia on morning drinking when the depression was not accounted for ($E=.0303$, $p<.0001$). After including PHQ-9 Depression as a mediator, the direct effect was still significant ($E=.0032$, $p=.0406$), suggesting partial mediation. On the other hand, when insomnia was the mediator variable, the total effect and direct effect had no significant change ("total effect" $E=.0414$ $p<.0001$) ("direct effect" $E=.0391$ $p<.0001$), suggesting no mediating influence.

Conclusion: These results suggest that the association between morning drinking and insomnia was significantly partially mediated by depression during the pandemic. When depression was the independent variable and insomnia as the mediated variable, there was no longer efficiency in the mediation model. These results suggest that observed associations between insomnia and morning drinking during the pandemic were partially mediated by depression.

Support (if any):

Abstract citation ID: zsad077.0304

0304**SLEEP QUALITY AND LIFE SATISFACTION IN SEVERELY DEPRESSED INDIVIDUALS**Brianna Zahorecz¹, William Killgore²¹ University of Arizona, ² University of Arizona College of Medicine

Introduction: Better sleep quality correlates with higher life satisfaction. However, the strength of this relationship in the severely depressed population has yet to be explored. We hypothesized that better sleep quality would more strongly predict higher life satisfaction in severely depressed individuals, as compared to those who are not severely depressed.

Methods: We conducted a 13 month cross-sectional study on mental health during the main months of the COVID-19 lockdown (April 2020-April 2021). We included the Pittsburgh Sleep Quality Index (PSQI), the Beck Depression Inventory (BDI), and the Satisfaction With Life Scale (SWLS) in months 1 ($N=1013$), 4 ($N=1043$), 7 ($N=1022$), and 10 ($N=1011$). Using this data, we ran a linear regression between total SWLS scores, which increase with higher life satisfaction, and their responses to item six on the PSQI: "During the past month, how would you rate your sleep quality overall?" which ranged from "very

bad” (score of 1) to “very good” (score of 4). The regression was split according to the set BDI score ranges for minimally (N=2178), mildly (N=624), moderately (N=667), and severely (N=609) depressed individuals from the entire sample.

Results: Total SWLS scores were positively correlated with PSQI sleep quality score in minimally, mildly, moderately, and severely depressed groups ($R_{\text{minimally}}=0.187$, $p<0.001$; $R_{\text{mildly}}=0.129$, $p=0.001$; $R_{\text{moderately}}=0.180$, $p<0.001$; $R_{\text{severely}}=0.438$, $p<0.001$). However, the R^2 value was far larger in the severely depressed group than it was in all other groups ($R^2_{\text{adj/severely}}=0.191$; versus $R^2_{\text{adj/minimally}}=0.034$, $R^2_{\text{adj/mildly}}=0.015$, and $R^2_{\text{adj/moderately}}=0.031$). This suggests that better sleep quality more strongly predicted higher life satisfaction in severely depressed individuals, compared to those who were not severely depressed.

Conclusion: While poor sleep quality and lower life satisfaction both tend to be associated with more severe depression, these findings suggest the associations between sleep and life satisfaction are far stronger in those who are the most severely depressed. Consequently, these findings suggest that interventions that focus directly on improving sleep quality would likely be a fruitful approach to increase life satisfaction in severely depressed individuals.

Support (if any):

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0305

USE OF SLEEP MEDICATION INCREASES WITH GREATER SEVERITY OF HAZARDOUS ALCOHOL USE

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Introduction: Hazardous alcohol use correlates with greater insomnia, potentially leading to increased use of sleep medications. However, combining sleep medications with alcohol can yield serious and even fatal health consequences. We examined the relationship between alcohol use and sleep medication use during the first year of the COVID-19 pandemic and hypothesized that greater alcohol use would correlate with increased use of sleep medication.

Methods: N=3,930 English-speaking adults from across the U.S. (Mage=37.2, SD=12.4) completed the Pittsburgh Sleep Quality Index (PSQI) and the Alcohol Use Disorders Identification Test (AUDIT) at one of four timepoints (April, July, and October of 2020 and in January of 2021). Individual use of sleep aids was measured by ranking them from 0 (none) to 2 (once or twice a week or more). Additionally, alcohol use was ranked from 0-3 where a higher score indicated higher alcohol dependence.

Results: Alcohol use was modestly but positively correlated with sleep medication use ($r = 0.183$, $p<0.001$). A chi-square analysis showed that the proportion of people reporting heavy use of sleep medications increased among those reporting greater severity of hazardous alcohol use ($p<0.001$). Specifically, 21.8% of those in the non-hazardous drinking category reported heavy use of sleep medications, while 25.3% of those in the hazardous drinking group described heavy sleep medication use. For those meeting criteria for probable alcohol dependence, 39.7% reported heavy sleep medication use, and

57.3% meeting criteria for severe alcohol dependence reported heavy sleep medication use.

Conclusion: We found that individuals who scored higher on alcohol use scored higher on sleep medication use, consistent with our hypothesis. These results show that during the COVID-19 pandemic, hazardous alcohol use and sleep medication use were significantly associated. Such findings are concerning, because when combined, alcohol and sleep medications can lead to serious health consequences, including impaired neurocognitive functioning, sleep disruption, parasomnias, risk of overdose, and even death. Given the potential severe risks associated with this behavior, increased clinical assessment, monitoring, and counseling about the dangers of mixing sleep medication with alcohol is warranted. Further work should identify the causal direction and potential mediating factors driving these associations.

Support (if any):

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0306

CIRCADIAN DISRUPTING LIGHT EXPOSURE WITHIN PEDIATRIC HOSPITAL ROOMS

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Introduction: Pediatric patients undergoing stem cell transplant (SCT) often experience extended hospitalizations. Inappropriate lighting during admissions is known to disrupt sleep and circadian health, which can result in worse health outcomes. This study aimed to describe patterns of light across 24-hour periods in two inpatient rooms of children undergoing SCT.

Methods: Wall-mounted light meters (Extech SDL400) continuously tracked noise and light levels at one-minute intervals in two patient rooms over six months. We determined the percent of time that patients were exposed to non-optimal light levels (< 448 lux during the daytime, >18 lux in the evening, >2 lux at night); thresholds were based on converting recent consensus-based melanopic equivalent daylight illuminance guidelines to vertically measured illuminance thresholds. We assessed the frequency that light exceeded thresholds associated with night wakings (>150 lux). Wilcoxon rank-sum tests compared light levels between the two rooms. Room A had a single north-west-facing window overlooking a narrow courtyard. Room B had an unobstructed window facing north.

Results: On average, hospitalized pediatric SCT patients spent 50% of their time in inappropriate light conditions. They were exposed to light spikes >150 lux on 2% of nights, with overnight light peaking at 513 lux. When comparing average daytime and nighttime light levels between the two rooms, Room A was significantly dimmer than Room B, $p < .001$. In the dimmer room, light levels never reached the recommended threshold during the daytime, and the light was too bright for 19% of the evening and 17% of the nighttime. In the brighter room, light levels were too dim during 97% of the daytime and too bright during 59% of the evening and 30% of the nighttime.

Conclusion: During the day, pediatric SCT patients are rarely exposed to light bright enough to preserve a healthy circadian rhythm. Hospitals have an opportunity to significantly improve the sleep and circadian health for children already at elevated risk for health morbidities during transplant.

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0307

DAY AND NIGHT LIGHT EXPOSURE ARE ASSOCIATED WITH PSYCHIATRIC DISORDERS: AN OBJECTIVE LIGHT STUDY IN >80,000 PEOPLE

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Introduction: Circadian rhythm disturbance is a common feature of many psychiatric disorders. Light is the primary input to the circadian clock, with daytime light strengthening rhythms and night light disrupting them. Therefore, habitual light exposure may represent an environmental risk factor for susceptibility to psychiatric disorders.

Methods: We performed the largest to-date cross-sectional analysis of light, sleep, physical activity, and mental health in participants from the UK Biobank actigraphy cohort ($n = 86,772$ adults; aged 62.4 ± 7.4 years; 57% women). We examined the independent association of day and night light exposure intensity with covariate-adjusted risk for psychiatric disorders and self-harm.

Results: Greater night light exposure was associated with increased risk for major depressive disorder, generalized anxiety disorder, PTSD, psychosis, bipolar disorder, and self-harm. Independent of night light, greater day light exposure was associated with reduced risk for major depressive disorder, PTSD, psychosis, and self-harm. These findings were robust to adjustment for sociodemographics, photoperiod, physical activity, and sleep quality.

Conclusion: Our findings demonstrate that low day light and bright night light exposure are associated with a wide range of psychiatric outcomes. Avoiding light at night and seeking light during the day may be a simple and effective, non-pharmacological means of broadly improving mental health.

Support (if any):

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0308

IMPACT OF CUSTOMIZED LIGHTING ON SLEEP IN HOSPITALIZED PATIENTS

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Introduction: Inpatient sleep may be disrupted for myriad reasons, including lighting exposure that is typically fixed at constant intensity and spectra. In this study we employed customized lighting that promotes circadian entrainment by exposing patients to blue-augmented lighting during the morning and blue-suppressed lighting evening to improve sleep timing and duration.

Methods: Two Mount Sinai hospital rooms (with 2 beds each) were outfitted with Eight Mattress sensors that use a combination of movement, breathing, heart rate, and temperature variables to estimate wake and sleep vigilance states in 30-second epochs. One room contained customized lighting between 7 am and 11 pm, while the other room contained standard hospital lighting. The current analysis includes 60 participants (30 in the control room and 30 in the custom lighting room), who were matched for time-of-year hospital admission date. We first analyzed the probability of sleep during any given 30-second epoch across each subject's admission and compared the distributions of sleep probability across the 24-hour cycle for all subjects in the lighting vs control conditions. We additionally evaluated total nocturnal sleep duration (11 PM – 7 AM) by 1) summing all sleep epochs on nights containing at least 50% valid data and 2) normalizing all measured sleep epochs to all valid sleep/wake outputs (excluding indeterminate epochs).

Results: The distribution of sleep probability was significantly different in the lighting vs control condition ($p < 0.001$) with most apparent diversion of the distributions between 9 pm and 9 am. The average raw nocturnal sleep duration was significantly higher in lighting condition (270.0 ± 23 minutes vs 201 ± 23 min in control, $p = 0.037$), as was the average minutes of sleep per hour of valid recording (36.9 ± 15 minutes vs 28.4 ± 13 in control, $p = 0.022$). There were no significant differences in the number of nocturnal wake or indeterminate epochs between conditions.

Conclusion: Custom lighting appears to promote sleep in hospitalized patients, but the interpretation is tempered by absence of full validation of the mattress sensor against polysomnography. Future work will evaluate differences in sleep timing and continuity between conditions.

Support (if any): McClung Foundation, R01 AG066870

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0309

LIGHT EXPOSURE BEFORE BEDTIME IN PREGNANCY IS ASSOCIATED WITH A HIGHER RISK OF GESTATIONAL DIABETES

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Introduction: Evidence suggests a link between mistimed light exposure and impaired glucose regulation among nonpregnant adults, yet little is known about the magnitude and significance of evening light exposure during pregnancy. This study examined the relationship between evening light exposure before sleep, during pregnancy, and the incidence of gestational diabetes mellitus (GDM).

Methods: In this prospective cohort study conducted at 8 U.S. clinical sites, nulliparous women wore a wrist actigraphy monitor and completed a daily sleep diary for seven days between 160 and 216 weeks' gestation. The primary exposure variable was time spent above 10 lux (dim light) during the three hours preceding sleep onset ("TAT10 pre-sleep"), averaged over valid days of recording and categorized to tercile groups ("High", "Medium", "Low"). Primary outcome variable was the incidence of GDM. Associations of TAT10 pre-sleep groups with baseline characteristics, sleep and activity variables were examined with Chi-squared and Kruskal-Wallis rank sum tests. Univariate and multiple logistic regression models were used to characterize the relationship between pre-sleep light exposure and GDM.

Results: 901 eligible women consented to participate; 758 submitted valid actigraphy recordings. Excluding women with pre-gestational diabetes and those with unknown gestational diabetes status, 741 were included in the analysis. Greater pre-sleep light exposure was associated with an increased risk of GDM (odds ratio [95% confidence interval]: 5.49 [1.8–23.84] in high and 4.05 [1.27–17.94] in medium vs 1 [reference] in low group). Women in the high group had more daytime light and were less likely to be late (midpoint > 5AM) or fragmented (wake after sleep onset $\geq$ 75th percentile) sleepers. Sleep duration, mean activity level, and light during sleep were not different between groups. After adjusting separately for age, body mass index, race/

ethnicity, sleep duration, sleep midpoint, education, employment schedule, season, and daytime light exposure, pre-sleep light exposure remained significantly associated with GDM.

Conclusion: Increased evening light exposure in pregnancy may be an under-recognized, potentially modifiable risk factor for GDM. Future research should investigate light-targeted interventions as a potential preventive strategy for GDM.

Support (if any): R01HL105549, nuMoM2b Network

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0310

LOW LIGHT EXPOSURE DURING WAKE IS ASSOCIATED WITH ANTEPARTUM DEPRESSIVE SYMPTOMS

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Introduction: Antepartum depression affects 7-16% of pregnant women and occurs most frequently in the 3rd trimester. Previous studies have demonstrated a relationship between the level and timing of daytime light exposure and depression in non-pregnant populations. However, much less is known about the relationships between light exposure and depression during pregnancy. Thus, in this study, we tested the hypothesis that exposure to less daytime light will be associated with more antepartum depressive symptoms.

Methods: Data from the Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-to-be (nuMoM2b) and the nuMoM2b Sleep Duration and Continuity Substudy were used (N=708). Women enrolled in the substudy wore wrist actigraphy (Spectrum, Phillips Respironics) and completed a sleep log for seven days between 160-230 weeks of gestation. Daytime light exposure was defined as minutes spent at or above the threshold of 50 lux (TAT50) during the wake period, averaged over valid actigraphy recording days. Participants were divided into two groups by TAT50: >25th percentile and $\leq$ 25th percentile. The Edinburgh Postnatal Depression Scale (EPDS) was administered during the 1st and 3rd trimesters. A positive screening was defined as an EPDS composite score ≥ 10 or any endorsement of self-injurious thoughts. Wilcoxon rank sum tests were used to test differences between TAT50 groups.

Results: Low light exposure during the day was associated with antepartum depressive symptoms during the 1st and 3rd trimesters, after adjusting for age, season, race, poverty, sleep midpoint, and sleep duration (OR 1.7, $p=0.047$). Additionally, later sleep timing, greater day-to-day sleep variability, and increased time spent awake after sleep onset was seen in those exposed to less light (all $p < 0.001$).

Conclusion: Lower daytime light exposure is associated with poorer sleep quality and may increase risk for antepartum depressive symptoms. These data suggest that in addition to improving sleep quality, promoting daytime light exposure may be a modifiable risk factor for depression during pregnancy.

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0311

PARTIAL BLUE LIGHT BLOCKING GLASSES ADVANCED SLEEP PHASE BUT DID NOT ALTER SALIVARY MELATONIN SECRETION IN JAPANESE SCHOOLCHILDREN

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Introduction: A late bedtime is one of the most common characteristics of sleep habits in modern society. This is also the case for schoolchildren, with negative consequences for their academic performance. Light exposure at night, particularly blue wavelength light, was thought to delay bedtime, and melatonin suppression via blue light was considered to be one of the mechanisms responsible for the delayed sleep phase.

Methods: In the current study, we evaluated the effects of partial blue light blocking glasses (JINS Screen Lens Heavy [40%cut]) on salivary melatonin levels, sleep and circadian phase and daytime behavior (via actigraphs and questionnaires), with and without blue light blocking (JINS Standard Clean Lens) glasses in 39 male school children (ages between 10-12). The study design was a cross over design, with respective glasses worn for 3 hours before the habitual bedtime for two weeks, with a one-week washout period (with their own regular glasses) in between sessions. Saliva collections and questionnaires were performed during the first and second weeks of each session, with saliva collected -3, -2, -1, and 0 hours before the habitual bedtime. Actigraph data were collected throughout the evaluation periods.

Results: We found that while partial blue light blocking glasses had no effect on salivary melatonin levels, they did significantly advance the sleep phase compared to the non-filter session (bedtime: 22.03±0.08h vs. 22.1±0.1h, sleep onset: 22.26±0.08h vs. 22.36±0.10h, $p=0.04$). The filter effects were most noticeable in the second week, where significant advances in bedtime (-0.12h, $p=0.03$), sleep onset (-0.14h, $p=0.03$), wake up time (-0.13h, $p=0.02$), and leaving-bed time (-0.14h, $p=0.02$) from the 1st week were observed, whereas no changes were seen during the control session (without filter). Along with the sleep phase advancement observed, daytime irritability and acting out towards siblings and friends were significantly reduced in the second week of the filter session.

Conclusion: Our results suggest that partial blue light blocking glasses advanced the sleep phase and improved behavior in schoolchildren, but that the effects were not mediated by changes in melatonin secretion. Further research into the mechanisms involved is warranted.

Support (if any): This study was supported by Jins Holdings Inc (SPO236998).

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0312

DYNAMIC LIGHTING IN MEMORY CARE FACILITIES TO IMPROVE SLEEP AND MOOD IN OLDER ADULTS WITH DEMENTIA

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Introduction: Of the estimated 5.8 million people in the United States diagnosed with dementia, approximately one-third experience a chronic sleep disorder. Poor sleep quality in older adults is associated with higher levels of depression, anxiety, agitation, and falls as well as lower levels of cognitive and memory performance. Light is the most important environmental element that is not only necessary to fulfill visual tasks but also is the main stimulus that regulates circadian rhythms. This study aims to investigate the effect of a dynamic lighting intervention on sleep quality and mood in older adults with dementia living in long-term care facilities.

Methods: The study is conducted as a within-subject study design over 7 days of conventional lighting (Baseline) followed by 21 days of room lighting (Placebo) and then 21 days of dynamic lighting (Treatment). The dynamic lighting intervention is designed to create an ambient illumination that provides a high level of circadian stimulation in the morning and circadian-neutral lighting in the evenings through delivering varying light intensity and spectrum. The placebo condition exposes participants to a static lighting condition that is equivalent to the average room lighting from morning to evening. The human-lighting interaction occurs in the common areas of the selected memory care facility in Phoenix Greater Area, AZ. Participants of this study are individuals over the age of 65 diagnosed with mild to moderate dementia. Actigraphy is conducted on the last 7 days of each condition to monitor sleep quality. Daily light exposure is tracked continuously throughout the waking day using a non-intrusive wearable sensor. Moreover, caregivers complete two questionnaires (Cornell Scale for Depression in Dementia (CSDD) and Cohen-Mansfield Agitation Inventory (CMAI)) every seven days to assess the short and long-term effects of each condition on mood and agitation.

Results: Findings show notable improvements in mood and nighttime sleep duration and efficiency in participants after exposure to the dynamic condition compared to the baseline and placebo.

Conclusion: The outcomes of this study provide strong evidence that ambient lighting in memory care facilities is a significant contributor to improving sleep and quality of life of older adults with dementia.

Support (if any): None

Abstract citation ID: zsad077.0313

0313

IMPLEMENTATION OUTCOMES FROM A MULTI- COMPONENT LIGHTING INTERVENTION IN SHIFTWORKERS ON A HIGH-SECURITY SUBMARINE WATCHFLOOR

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Introduction: Shiftwork is prevalent in the military and causes circadian health and performance impairments. Negative consequences may be mitigated through evidence-based lighting solutions that optimize timing, spectrum and intensity of exposure; however, the practical utility of these solutions hinges on their implementation and adoption. Therefore, we examined the implementation effectiveness of a multi-component lighting intervention that had demonstrated efficacy for improving alertness and performance in active duty service members working nightshift schedules on a high-security watchfloor.

Methods: Participants worked 12-h shifts (0530-1730) (N=56, 9 females; mean±SE age=28.95 ± 0.76). Lighting interventions included two types of LED panels (3,721 cm²) that were either enhanced (SW+) or depleted (SW-) in short wavelength energy (both ~3000 K, ~300 lux at 46 cm from eyes). For both SW+ and SW- conditions, a bank of panels were arranged across the front of the watchfloor and illuminated the entire nightshift. In addition, blue-blocker glasses were worn after nightshifts up until bedtime, and eye masks were worn during sleep for both intervention conditions. Data collection coincided with existing watchfloor schedules: there was an 8-day baseline (BL1) and 8-day SW+ condition, and an 8-day baseline (BL2) and 8-day SW- condition (order within those 16-day periods was pseudo-randomized). Implementation was measured via weekly questionnaires.

Results: Participants who completed BL1, SW+, and SW- conditions (n =24) reported more positive feelings (happy, alert, relaxed) and fewer negative feelings (sad, sleepy, anxious) with both interventions compared to standard lights (BL1) (p< 0.05 for both SW+ and SW-). More negative symptoms (e.g. glare, headache, fatigue) were reported in BL1 versus the intervention conditions (p< 0.01). Most participants reported that alertness was the same or better under intervention conditions (96% SW+, 95% SW-); 75% found both the blue-blocker glasses and eye masks somewhat or very easy to use; and 100% reported sleep as either the same or better with each intervention tool. Finally, most participants reported they would want to keep the intervention lights at the end of the study.

Conclusion: The intervention was generally well-received by participants, thus providing evidence for the feasibility of implementing multi-component lighting strategies to mitigate the negative consequences of shiftwork.

Support (if any): ONR TS-788

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0314

LATE EVENING ROOM LIGHT AND SLEEP RESTRICTION REVERSES THE PHASE ADVANCING EFFECT OF BRIGHT MORNING LIGHT IN ADOLESCENTS

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Introduction: Late bedtimes and sleep restriction are common during adolescence, particularly on school nights. We examined circadian phase advancing effects of bright morning light (ML) with increasing doses of evening room light exposure and sleep restriction due to late bedtimes.

Methods: Adolescents (n=38, 21 girls) aged 14.1 to 18.0 years completed a 14-day protocol during summer vacation. On days 1-7, they slept at home on individualized 10-h sleep/dark schedules. On days 8-14, they lived in the laboratory. On day 8, we measured their Dim Light Melatonin Onset (DLMO). On days 9 and 10, they were put to bed 1.5h (n=9), 3.0h (n=12), or 4.5h (n=8) later and kept awake in room light (104±11 lux at the angle of gaze). Wake time was unchanged; thus, sleep opportunity was shortened to 8.5h, 7h, and 5.5h, respectively. The fourth group (n=9) kept their baseline bedtime, were not exposed to any additional evening light (EL) and were not sleep restricted. On day 11, all groups were put to bed and awakened 1.5 h earlier and were exposed to intermittent bright ML (three 30-min exposures; 8599±885 lux). On each subsequent day (12 and 13), sleep and ML were advanced 1h. Thus, there were 3 days of a gradually advancing sleep schedule and bright ML. Final DLMO was measured on day 14.

Results: The 0h EL group showed a large DLMO advance (2.2±1.0 h), but the advance was reduced in the 1.5h EL group (0.5±0.6 h). DLMO delayed in the 3h EL group (-0.9±1.1 h). There was a large phase delay in the 4.5h EL group (-2.6±1.2 h). Phase shifts differed among all groups [F(3,34)=36.7, p<.001].

Conclusion: Circadian rhythms of adolescents were advanced when they were exposed to bright ML and a gradually advancing sleep schedule, as shown in many studies of adults. However, when kept up later in ordinary room light, the same advancing sleep schedule and bright ML did not produce as much of an advance. Phase delay shifts occurred when bedtimes were 3h or 4.5h later. EL and sleep restriction can reverse the advancing effect of bright ML.

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0315

PHASE SHIFTING IN RESPONSE TO LIGHT FLASH SEQUENCES DURING SLEEP

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Introduction: The human circadian clock is synchronized to the outside world through regular ocular light exposure. Light does not need to be continuous to be an effective time cue. Light administered as a sequence of light flashes can be more effective than continuous light of the same illuminance. Exposure to a sequence of light flashes while awake is annoying, but such exposure can occur during sleep, without disrupting sleep, when the circadian system is most sensitive to light. As such, the purpose of this experiment was to determine the magnitude of circadian phase shift that could be obtained when exposing individuals to light flash sequences during sleep.

Methods: Healthy young individuals (n=10) participated in a crossover study of two separate 16-d protocols, the order of which was randomized. The first 14 d were an at-home circadian phase/amplitude optimization period, followed by a 37-h in-laboratory stay during which participants had constant routines (CR) on two consecutive evenings. The onset of salivary melatonin determined during the CRs was used as a marker of circadian phase. Light was dim (< 5 lux) or dark between CRs, except for the light flashes (2-ms flashes, ~1500 lux, every 15 s for 1 h) that were administered via custom goggles while participants slept (starting 30 m after habitual bedtime). During the

placebo condition, the goggles provided no light. The impact of the light on circadian phase (pre-post) and polysomnographically-measured sleep were assessed.

Results: As compared to the control condition (12 ± 20 minutes), exposure to the flashes engendered substantial shifts (1.13 ± 1.27 h, $p < 0.01$; $d = 1.02$). There was considerable variability in response to the stimulus, with two individuals not displaying any phase changes, three having a modest phase change (< 1 hour), two having a moderate phase change (1-2 hours) and two having a large phase shift (> 2 hours), one of whom shifted more than 6 hours. There were no significant differences in sleep on placebo or flash exposure nights.

Conclusion: Exposure to a sequence of light flashes during sleep has the capacity to engender large changes in circadian timing without necessitating behavior changes during wake to receive phototherapy.

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0316

A CASE REPORT: COMPARING SLEEP WITH AND WITHOUT BLUE LIGHT BLOCKERS

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Introduction: Blue light filtered eyewear is popular. Studies have looked at the effect of using blue light blockers in the evening but data is lacking on the effect of wearing blue light blockers (BLB) through the day. In this study we compared the effects of wearing BLB all day, on sleep and daytime sleepiness.

Methods: This is a single case report. A 32 year male wore an Actiwatch Pro and collected sleep diaries for 18 days. On days 1-9, non-blue light blocking eyewear (NBLB) were used all day. On days 10-18, BLB were used all day. Karolinska Sleepiness Scale (KSS) and Stanford Sleepiness Scale (SSS) during morning, afternoon and before sleep were recorded. IBM SPSS v. 29.0.0 is used for descriptive analysis, Pearson correlation and T-test comparison.

Results: White light exposure was not statistically different from BLB and NBLB. Data measured in minutes. Mean and standard deviation of in-bed duration with NBLB was 477.89 ± 66.17 and with BLB was 518.06 ± 53.06 ($p = 0.087$). Sleep time with NBLB was 431.89 ± 52.05 and with BLB was 471.72 ± 48.49 ($p = 0.056$). Wake After Sleep Onset (WASO) with NBLB was 43.78 ± 18.63 and with BLB 46.33 ± 14.25 ($p = 0.374$). Percent Sleep with NBLB was $90.96 \pm 2.83\%$ and with BLB was 91.09 ± 2.29 ($p = 0.459$). KSS scores for morning on NBLB was 1.75 ± 1.035 and 1.00 ± 0 with BLB ($p = 0.023$), afternoon NBLB 4.13 ± 1.25 , BLB 3.67 ± 0.87 ($p = 0.194$), before sleep NBLB 8.5 ± 1.41 and 8.56 ± 0.53 with BLB ($p = 0.457$). SSS scores for morning on NBLB was 1.63 ± 0.744 and 1.00 ± 0 with BLB ($p = 0.012$), afternoon NBLB 3.38 ± 1.06 , BLB 3.56 ± 0.88 ($p = 0.353$), before sleep NBLB 7.00 ± 1.41 and 7.89 ± 0.60 with BLB ($p = 0.053$). There was a strong correlation between white light exposure and increased WASO (Pearson 0.514) and strong negative correlation (Pearson -0.535) between white light exposure and percent of sleep duration.

Conclusion: Although there were no statistically significant differences between the sleep parameters between NBLB and BLB, we found a strong correlation between sleep time and white light exposure and negative correlation. When using BLB morning alertness was better.

Support (if any):

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0317**A SINGLE-ARM PROOF-OF-CONCEPT CLINICAL TRIAL OF A MINDFULNESS-BASED INTERVENTION FOR PRENATAL INSOMNIA**

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Introduction: Cognitive behavioral therapy for insomnia (CBTI) improves sleep in pregnancy, but its therapeutic benefits may be diminished in pregnancy due to undertreatment of cognitive arousal (i.e., heightened cognitive activity, especially at night). Growing evidence indicates that mindfulness-based interventions produce large reductions in cognitive arousal, which may enhance insomnia therapy outcomes. The present study was a proof-of-concept, single-arm trial of Perinatal Understanding of Mindful Awareness for Sleep (PUMAS), which places behavioral sleep strategies within a mindfulness intervention framework and tailors sleep and mindfulness components to pregnancy. We evaluated patient engagement, treatment outcomes, and patient feedback from 12 pregnant women with insomnia who received PUMAS treatment.

Methods: Twelve pregnant women with DSM-5 insomnia disorder were treated with six weekly telemedicine sessions of PUMAS. Patient engagement was operationalized as session attendance. Treatment outcomes were assessed before and after PUMAS, which included the insomnia severity index (ISI), Edinburgh postnatal depression scale (EPDS), pre-sleep arousal scale's cognitive factor (PSASC), and Glasgow sleep effort scale (GSES). Patients completed the Consumer's report treatment satisfaction scale and provided treatment feedback.

Results: Eleven of 12 patients completed all six sessions (91.7%). Intent-to-treat analyses revealed very large reductions in ISI (ISI: 14.50 ± 2.50 to 3.67 ± 3.11 ; $p < .001$, Cohen's $d = 3.05$), resulting in an 83.3% insomnia remission rate ($n = 10/12$). Among the five patients with comorbid depression ($EPDS \geq 10$), PUMAS produced large antidepressant effects ($EPDS$: 14.00 ± 3.32 to 5.00 ± 2.55 ; $p = .004$, Cohen's $d = 2.76$), and all five patients remitted from depression at posttreatment. PUMAS yielded very large reductions in cognitive arousal ($PSASC$: 20.75 ± 4.58 to 12.50 ± 4.23 , $p < .001$, Cohen's $d = 2.08$) and sleep effort ($GSES$: 5.92 ± 2.64 to 2.08 ± 1.62 ; $p < .001$, Cohen's $d = 2.06$). Patients reported the highest rates of treatment satisfaction for improvement in insomnia (100%), energy (90.9%), pregnancy stress (90.9%), mood (90.9%), and coping with stress (83.3%). Patients identified sleep restriction and meditations as the most helpful PUMAS components.

Conclusion: Pregnant women with DSM-5 insomnia disorder are engaged in PUMAS, which produced large reductions in insomnia, depression, cognitive arousal, and sleep effort. Patients reported high satisfaction across several domains of functioning. This trial supports testing PUMAS in a randomized controlled trial.

Support (if any):

Abstract citation ID: zsad077.0318

0318**EARLY SLEEP INTERVENTION MITIGATES POOR SLEEP AND IMPROVES MOOD IN THE COVID-19 PANDEMIC**

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Introduction: Rates of sleep disturbance and depressed mood increased during the COVID-19 pandemic. Acute symptoms of sleep disturbance may develop into chronic insomnia if left untreated and constitute a risk for depression. However, the impact of early treatment of insomnia symptoms on the development of chronic insomnia and depressive symptoms remains unknown. Here we present the primary outcome results from a pre-registered, 2-arm randomized controlled feasibility trial launched early in the pandemic, investigating whether a brief telehealth insomnia intervention targeting acute insomnia symptoms prevents the subsequent deterioration of insomnia and depression.

Methods: Forty-nine participants with pandemic-onset insomnia symptoms were randomized to receive four telehealth sessions of Cognitive Behavioral Therapy for Insomnia (CBT-I) over five weeks or to a waitlist control. Primary outcome measures included the Insomnia Severity Index and the Patient Health Questionnaire-9 excluding the sleep item collected at weeks 0, 6, 12, and 28. Linear mixed-effects models tested the hypotheses that early insomnia intervention improves the 28-week trajectory of insomnia and depressive symptoms relative to the control group. The MacArthur framework tested if improvement of insomnia mediates subsequent improvement in depression.

Results: The two linear mixed-effects models revealed significant time-by-intervention interactions, indicating improved trajectories of insomnia and depressive symptoms across the 28-weeks in the CBT-I group compared to the control group (Insomnia: $B = -1.03$, $p < .001$; Depression: $B = -0.52$, $p = 0.009$). The rate of improvement in insomnia during treatment (0-5 weeks) mediated the subsequent improvement in depressive symptoms following treatment (6-weeks; $B = 2.31$, $p = 0.005$), but not at 12- or 28-weeks (all B 's ≤ 1.44 , all p 's > 0.203). In contrast, depression symptom improvement during treatment was not associated with insomnia symptoms (all timepoint p 's ≥ 0.132). The percentage of participants with insomnia diagnosis was lower in the CBT-I vs control group at both timepoints (short-term: 21.7% vs. 50%; long-term: 22.7% vs. 50%).

Conclusion: These are the first findings establishing that brief telehealth CBT-I significantly improved both acute pandemic-onset insomnia symptoms and subsequent trajectory of insomnia and depression. Although the sample size was small and pandemic conditions may never fully be replicated, these results support treatment of acute sleep disturbance in the context of stressors for improved long-term sleep and mood symptoms.

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0319

EVALUATING ILLNESS SEVERITY FROM ACUTE TO CHRONIC INSOMNIA: IS THE FIRST THE WORST?

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Introduction: The Spielman 3P and Perlis 4P models represent illness severity over the course of insomnia disorder. The 3P model suggests that illness severity is worst when subjects experience acute illness (as compared to the subchronic and chronic phases of the disorder). The 4P model suggests that illness severity crescendos with chronicity. The present analysis uses an archival data set to assess illness severity with new onset illness (i.e., from Good Sleep [GS] to Acute Insomnia [AI] and from AI to Chronic Insomnia [CI]). Illness severity is quantified in terms of Total Wake Time (TWT). Number of affected days/week is a tabulation of nights/week with clinical insomnia symptoms.

Methods: Subjects were recruited as GSs (N=911), followed up to 1-year with digital sleep diaries, and were classified as GS, AI, or CI based on standardized criteria. Data for CI subjects were anchored to the 1st of 14 days with insomnia so that day-to-day TWT, SL, WASO, and EMA were represented for ~100 days prior-to-and-following AI onset. A similar graphic (+/- Acute onset) was constructed for number of days per week with insomnia. GS data were matched to CI subjects dates (i.e., the data were temporally tethered). Segmented linear mixed regression models were applied to examine the change in slopes in the AI-to-CI period compared to GS and AI period.

Results: 883 subjects remained as GSs (Mage=53.1±10.8years;35.1%female;83.0%white), while 28 individuals transitioned to AI and then CI (Mage=53.6±12.6years;39.3%female;89.3%white). Average TWT rose over the course of the first 2 weeks from the AI onset ($t(b=1.6, SE=0.52 \text{ minutes}, p=0.002)$) and then was stable for 3 months ($b=-0.004, SE=0.03, p=0.91$). This worsening of sleep continuity was almost entirely related to increased WASO. Average number of affected days was found to be stable from AI to CI ($b=0.002, SE=0.002, p=0.20$). That is, while there was week-to-week variability in the number of days affected, no linear trend was evident.

Conclusion: These data suggest that, in our sample of CIs with primarily middle insomnia, the average severity and number of affected days was worst with the onset of AI (worst is first) and stable thereafter. Whether this temporal trend applies equally to new onset Initial and Late insomnia remains to be determined. Analyses ongoing.

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0320

IMPROVEMENTS IN SLEEP & DRINKING OUTCOMES AMONG HEAVY DRINKERS FOLLOWING A DIGITAL CBT-I PROGRAM

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Introduction: Insomnia and Alcohol Use Disorder (AUD) and are highly comorbid, due in part to the use of alcohol as a sleep aid among individuals with insomnia. Initial studies have shown that cognitive behavioral therapy for insomnia (CBT-I), the first-line treatment for insomnia, is moderately successful at improving both sleep and drinking outcomes in heavy drinkers with insomnia. However, CBT-I is not widely available. Digital CBT-I could be a more accessible alternative. One digital CBT-I program, Sleep Healthy Using the Internet (SHUTi), is especially promising due to its high efficacy in treating insomnia and its individualized and interactive platform. Here we conducted a pilot study to examine the efficacy of SHUTi on improving sleep and drinking outcomes in a sample of heavy drinkers with insomnia.

Methods: Heavy drinking men and women with insomnia (n=53) were randomly assigned to complete the SHUTi program (n=26) or a nine-week patient education control program (n=27). Questionnaires examining sleep (Insomnia Severity Index and Pittsburgh Sleep Quality Index) and alcohol use (30-day Timeline Follow-Back) were completed pre-intervention, post-intervention, and 3-months post-intervention. Linear mixed effect models were used to examine the effects of SHUTi on sleep and alcohol consumption and whether any effects of SHUTi on drinking were mediated by the effects of SHUTi on sleep.

Results: SHUTi significantly improved sleep (ISI & PSQI; $ps \leq .021$) and drinking outcomes (past 30-day total drinks, drinking days, and binge episodes; $ps \leq .032$) over time relative to the control condition. Additionally, the effects of SHUTi on drinking quantity, but not frequency, were mediated by SHUTi's effects on sleep.

Conclusion: These results show that SHUTi is an effective intervention for improving sleep among heavy drinkers with insomnia. Further, they suggest that sleep may be an effective treatment target to slow the progression of AUD in at-risk individuals. Together, these findings provide preliminary support for the implementation of an inexpensive, easily accessible health behavior intervention with significant public health impact in a high-risk population.

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0321

MANUALLY SCORING ACTIGRAPHY IN THE ABSENCE OF A SLEEP DIARY: RELIABILITY ANALYSIS IN GULF WAR VETERANS

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Introduction: Sleep disturbance and chronic health conditions are common in military and veteran populations. These individuals may have difficulty accurately and consistently completing sleep diaries, which traditionally have been used as a prominent data input in scoring actigraphy. While actigraphy is considered an objective sleep measure, the process of manually scoring actigraphy data can be subjective, particularly in military/veteran and clinical populations. Few studies utilize and report clear actigraphy scoring guidelines. To promote internal consistency and replicability in actigraphy scoring procedures, this study developed a detailed actigraphy scoring protocol for cases without sleep diary data and performed an inter-rater reliability analysis using a sample of veterans with Gulf War Illness (GWI).

Methods: One hundred fifty-nine nights of actigraphy (Phillips Respironics) data from a random subsample of 25 veterans with GWI were independently, manually scored using the protocol. Mean values for the start and end of rest intervals and derived sleep parameters—time in bed (TIB), total sleep time (TST), and sleep efficiency (SE)—and mean differences were calculated. Inter-rater reliability was evaluated using intra-class correlation (ICC).

Results: No significant differences were observed between manual scorers for mean values for the end of manually scored rest intervals and derived sleep parameters (TIB, TST, and SE). There were significant differences in the start of a rest interval, though the magnitude of the difference ($0:06 \pm 28$) was less than the clinically important 15-minute difference noted in the literature. ICC demonstrated excellent agreement between manual scorers for rest interval start (0.98) and end times (0.99), TIB (0.94), TST (0.98), and SE (0.97).

Conclusion: This protocol may serve as a reproducible set of guidelines for researchers manually scoring actigraphy and enhance internal consistency for studies using this actigraphy scoring software, especially for those working with military populations and clinical populations with significant sleep disturbance and related difficulties yielding quality sleep diary data.

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0322

MEASURING SLEEP-WAKE STATE DISCREPANCY IN A HETEROGENEOUS SAMPLE OF CANCER SURVIVORS WITH INSOMNIA SYMPTOMS

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Introduction: Sleep-wake state discrepancy is a common phenomenon identified among people with insomnia where greater sleep difficulties are self-reported in comparison with estimates obtained from objective assessment. This study provides the investigation into the sleep-wake state discrepancy and correlation between sleep diary (subjective) and actigraphy-derived (objective) sleep measures.

Methods: Participants included 136 cancer survivors with insomnia symptoms (M age = 63.8 ± 10.0 ; 55.9% female; 87.5% White) from baseline data in an ongoing clinical trial. Demographics, Insomnia Severity Index (ISI), 7-consecutive days of sleep diary and actigraphy data were obtained. Sleep measures included time in bed (TIB), total sleep time (TST), sleep onset latency (SOL), wake after sleep onset (WASO), and sleep efficiency (SE%). Mean bias was defined as the discrepancy between sleep diary and actigraphy-derived sleep measures. The agreement between sleep diary and actigraphy-derived sleep measures were graphically assessed using the Bland-Altman plot. Using the mixed linear model approach, the estimated bias and 95% limits of agreement (LOA) were computed. Further, the Pearson correlation coefficient and concordance correlation coefficient (CCC), computed via maximum likelihood methods, were obtained.

Results: Self-reported TST and SE were shorter than derived by actigraphy (TST: 6.8 min. [95%CI: -18.7, 5.13]; and SE%: 0.7% [95%CI: -3.0, 2.0], respectively). Self-reported TIB, SOL, and WASO were longer than derived by actigraphy (TIB: 8.6 min. [95%CI: 3.7, 13.5]; SOL: 14.8 min. [95%CI: 9.4, 20.2]; and WASO: 20.7 min. [95%CI: 9.4, 20.2], respectively). Moderate to high agreement and correlation were found between the sleep diary and actigraphy-derived TIB (CCC=0.78; $r=0.73$) and TST (CCC=0.58; $r=0.51$). In contrast, SOL (CCC=0.48; $r=0.35$), WASO (CCC=0.36; $r=0.18$), and SE% (CCC=0.39; $r=0.22$) showed only fair or poor agreement and correlation. Calculated Bland-Altman LOA between sleep diary and actigraphy derived measures were as follows: TIB (95%LOA: -121.5, 138.7), TST (95%LOA: -197.9, 184.3), SOL (95%LOA: -82.5, 112.1), WASO (95%LOA: -123.5, 164.8), and SE% (95%LOA: -0.37, 0.36).

Conclusion: Among a heterogeneous sample of cancer survivors with insomnia symptoms, average self-reported sleep duration and efficiency were shorter and self-reported TIB, SOL, and WASO were longer than objectively measured sleep measures. Agreement between two methods varied across different measures.

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0323

NATURAL EVOLUTION OF INSOMNIA IN MAJOR DEPRESSIVE DISORDERS

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Introduction: Insomnia is a fairly common sleep disturbance affecting nearly one third of the general population. Although its predictive value for major depressive disorder (MDD) has been well documented, little is known about its role in the appearance of a first episode or in the recurrence. In this study, we examine the predictive value of insomnia symptoms in the incidence and recurrence of MDD.

Methods: In this longitudinal study, 2 interview waves were conducted between 2002 and 2015. The initial interviews (wave 1 [W1]) were carried out with 12,218 individuals aged ≥18 years from the general population in 8 US states. At follow-up 3 years later (wave 2 [W2]), 10,931 of the initial participants agreed to be interviewed again. Data were analyzed for the individuals who participated in both interviews (N=10,931). A diagnosis of MDD was made according to Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria. Insomnia symptoms were defined according to DSM-5 criteria A, C, and D for insomnia disorder.

Results: The 12-month prevalence of MDD was 9.5% (95% CI, 9.0%-10.0%) and 12.1% (95% CI, 11.5%-12.7%) in W1 and W2, respectively. Over the course of the study, 2.6% of participants experienced recurrence of depression (95% CI, 2.3%-2.9%). After adjusting for age, gender, race, and body mass index, participant characteristics in W1 that predicted recurrent MDD in W2 included early morning awakenings (EMA) (relative risk [RR], 3.2; 95% CI, 2.3-4.4), being dissatisfied with one's sleep (RR, 2.8; 95% CI, 2.1-3.7), nocturnal awakenings (RR, 2.4; 95% CI, 1.8-3.2), and difficulty initiating sleep (DIS) (RR, 2.0; 95% CI, 1.5-2.9). MDD incidence was predicted by DIS (RR, 3.8; 95% CI, 2.5-5.9), being dissatisfied with one's sleep (RR, 2.1; 95% CI, 1.4-3.2), and EMA (RR, 2.0; 95% CI, 1.2-3.2) at W1.

Conclusion: Insomnia symptoms appear to play an important part in predicting both the development of a first depressive episode as well as the recurrence of depression.

Support (if any): Data analysis study were funded by Takeda Pharmaceutical Company.

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0324

PROTECTIVE AND RISK FACTORS FOR INSOMNIA OVER 5 YEARS IN A POPULATION-BASED SAMPLE OF ADULTS

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Introduction: Insomnia is a major public health concern and one of the most prevalent health issues among adults. Identifying protective and risk factors for insomnia could help identify vulnerable populations and design public health interventions to prevent some adverse medical and mental health consequences.

The study objective was to identify protective and risk factors for insomnia in a population-based sample of adults.

Methods: Data is from a large epidemiological cohort study on the natural course of insomnia conducted in Canada before the COVID-19 pandemic. Insomnia and potential protective and risk factors for insomnia were measured annually over 5 years with validated questionnaires (e.g., Insomnia Severity Index, Pittsburgh Sleep Quality Index, State-Trait Anxiety Inventory, Beck Depression Inventory, Perceived Stress Scale, Coping Inventory for Stressful Situations, Ford Insomnia Response to Stress Test, Arousal Predisposition Scale, Life Experiences Survey). Risk factors for insomnia were divided as predisposing or precipitating factors.

Results: From a cohort of 3,413 participants 1,709 adults were identified as good sleepers at baseline and were included in the analyses. A total of 202 people developed an insomnia syndrome during the 5-year follow-up. Using survival analysis for discrete events, the following variables were significant predisposing factors for insomnia: anxiety (HR=1.037; p=0.018), depression (HR=1.082; p< 0.001), perceived stress (HR=1.073; p< 0.001), number of negative life events (HR=1.478; p=0.02), perceived worse general health (HR=1.606; p=0.006), pain (HR=1.475; p=0.002), vulnerability to stress (HR=1.089; p< 0.001), and maladaptive emotional coping (HR=1.044; p< 0.001). The following variables were identified as precipitating factors for insomnia: loss of income (HR=1.346; p=0.03), increased anxiety (HR=1.070, p< 0.001), depression (HR=1.119; p< 0.001) and perceived stress (HR=1.083; p=0.001), decline in perceived general health (HR=2.061; p=0.006), and increased pain (HR=1.353; p=0.013). Physical activity was not a significant protective factor for insomnia (p=0.54).

Conclusion: These results provide new information that could be helpful to prevent the onset and chronicity of insomnia by targeting specific precipitating factors, and people with predisposing factors for insomnia. This is important as insomnia tends to be a persistent condition and is known to increase adverse medical and mental health outcomes.

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0325

REDUCING NOCTURNAL COGNITIVE AROUSAL AND RUMINATION MEDIATE TREATMENT EFFECTS OF DIGITAL COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA

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Introduction: High cognitive arousal—i.e., heightened cognitive activity often in the form of perseverative thinking—is a central feature insomnia. Emerging evidence from randomized controlled trials (RCTs) support alleviating cognitive arousal as a mechanism by which cognitive behavioral therapy for insomnia (CBTI) reduces symptoms of insomnia and depression. However, few RCTs have published CBTI data on cognitive arousal outcomes. The present study tested whether CBTI

alleviates cognitive arousal symptoms, and whether reducing cognitive arousal symptoms mediate CBTI effects on insomnia and depression.

Methods: 434 patients with clinical insomnia symptoms (Insomnia Severity Index [ISI] ≥ 15) were randomized to digital CBTI or digital sleep education control. Study outcomes included insomnia (ISI), depression (quick inventory of depressive symptomatology self-report 16-item survey, QIDS-SR16), and two indices of cognitive arousal (pre-sleep arousal scale's cognitive factor [PSASC] and daytime insomnia symptoms response scale [DISRS]). Treatment effects and mediation analyses were conducted using multivariate linear regression.

Results: While controlling for baseline symptoms, CBTI patients, relative to controls, reported lower levels of insomnia ($b=-2.45$, $p<.001$), depression ($b=-1.13$, $p<.001$), nocturnal cognitive arousal ($b=-2.37$, $p<.001$) and insomnia-focused rumination ($b=-3.43$, $p<.001$) after treatment. Posthoc independent samples t-tests showed that CBTI produced small-medium effects on nocturnal cognitive arousal (Cohen's $d=.40$) and insomnia-focused rumination (Cohen's $d=.31$). Mediation analyses showed that reducing nocturnal cognitive arousal (PSASCT2-T1) mediated 29.0% of CBTI effects on insomnia ($\alpha\beta=-.709$, 95%CI=-1.09, -0.38), and 35.1% of CBTI effects on depression ($\alpha\beta=-.397$, 95%CI=-0.65, -0.19). Mediation analyses showed that reducing insomnia-focused rumination (DISRST2-T1) mediated 10.6% of CBTI on insomnia ($\alpha\beta=-.261$, 95%CI=-0.50, -0.08), but did not mediate antidepressant effects ($\alpha\beta=-.300$, 95%CI=-1.46, 0.72).

Conclusion: Digital CBTI effectively alleviated nocturnal cognitive arousal and insomnia-focused rumination. Moreover, alleviating nocturnal cognitive arousal was a mechanism by which CBTI reduced symptoms of insomnia and depression. By comparison, reducing insomnia-focused rumination mediated a small proportion of CBTI effects on insomnia and was uninvolved in depression effects. Although reducing cognitive arousal facilitated insomnia and depression outcomes, CBTI is likely limited by its modest effects on cognitive arousal symptoms. Improving insomnia therapy benefits for cognitive arousal may enhance patient outcomes.

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0326

SYMPTOM TRAJECTORIES IN ADULTS WITH STABLE HEART FAILURE AND INSOMNIA: EVIDENCE FROM A RANDOMIZED CONTROLLED TRIAL OF CBT-I

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Introduction: Cognitive behavioral therapy for insomnia (CBT-I) improves individual symptoms of fatigue and daytime sleepiness; however, little is known how CBT-I improves multiple co-occurring daytime symptoms. The purposes of this study are to (1) identify daytime symptom trajectories in adults with insomnia and stable chronic heart failure (HF) over one year, and (2) determine how symptom trajectories vary based on participation in CBT-I or HF self-management education (attention control condition).

Methods: We conducted a retrospective analysis of data from a randomized controlled trial that looked the sustained effects of CBT-I compared to HF self-management over one year (NCT02660385). We measured daytime symptoms (fatigue, depression, anxiety, dyspnea, pain, and daytime sleepiness) at baseline (pre-treatment) and 3, 6 and 12 months. Symptom cluster trajectory were identified using group-based trajectory modeling, and the association with CBT-I was examined using logistic regressions.

Results: We randomized 175 participants (M age=63.0 (12.9) years, 57% men). We found four daytime symptom cluster trajectories, (A) low improving symptoms (N = 67, 38.3%); (B) low psychological symptoms and high improving physical symptoms (N = 40, 22.8%); (C), high improving symptoms (N = 42, 24.0%); and (D) high not improving symptoms (N = 26, 14.9%). There was no statistically significant difference between CBT-I and HF self-management across 4 symptom trajectories ($p = .2509$). However, people who received CBT-I vs. HF self-management education had higher odds of belonging to trajectory A compared to B/C/D after controlling for baseline fatigue (OR = 3.27 95% Confidence Intervals [1.39, 7.68]).

Conclusion: Most participants experienced improved daytime symptom profiles over 12 months after both interventions. Participants in the CBT-I group experienced symptom improvement even when they started with low symptoms.

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0327

THE EFFECTS OF WEARABLE DEVICE DATA ON SLEEP DIARY-DERIVED METRICS OF SLEEP

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Introduction: Precision measurement of sleep metrics like sleep onset latency (SOL) and total sleep time (TST) has long been a challenge. Multiple studies have demonstrated significant discrepancies between sleep diaries and wearable device derived sleep metrics especially in patients with subjective-objective sleep discrepancy (SOSD; e.g., some patients with insomnia). Typically SOSD manifests as longer than expected self-reported SOL and shorter than expected TST. Without a method of reconciliation between sleep diaries and wearable devices, the current practice is to rely on sleep diary data which is suboptimal in the context of SOSD, and could contribute to blunted or nonsignificant effects in clinical trials. The current study investigated the effects of providing wearable device data feedback contemporaneously with the completion of the sleep diary, on a daily basis across 288 nights. We expected that by providing wearable device data feedback, participants with SOSD could be identified and potentially self-correct their SOSD.

Methods: A 3 phase, randomized, crossover design study was used in which 24 undergraduate college students without a diagnosed sleep disorder completed week-long periods of control condition (digital sleep diary without wearable device data feedback), washout, and then test phase (diary with device feedback). Participants were randomized to start with control or test conditions.

Results: Within and between subjects analyses were performed to understand the effect of the wearable device data feedback on sleep diary responses. Two participants (8.3%) with SODS were identified and had marked differences in their estimated SOL (~47 min) that were corrected when provided with their wearable device data. Importantly no subjects copied their wearable device data into their sleep diary. Between subjects analyses revealed no differences in the average or variability of sleep metrics.

Conclusion: These preliminary results suggest that presenting wearable device data during sleep diary completion may impact self-reporting by individuals with SODS but not by those without SODS. In the setting of a clinical trial, participants who have significant SODS may be contributing to non-disease/non-treatment related variability that may be ameliorated by providing wearable device data during sleep diary completion.

Support (if any):

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0328

THE NATURAL HISTORY OF INSOMNIA: HIGH SLEEP REACTIVITY INTERACTS WITH GREATER LIFE STRESS TO PREDICT THE ONSET OF ACUTE INSOMNIA

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Introduction: Previous studies have shown that stressful life events are the primary trigger in the development of insomnia. One etiological model of insomnia suggests that sleep reactivity, or the vulnerability to stress-related sleep disturbance, may be an important moderator of this association. That is, some individuals have a predisposition to experience insomnia following acute stressors (i.e., sleep reactivity). The goal of the present study was to provide a proof of concept and, specifically, additional empirical evidence that the link between stressful life events and the onset of acute insomnia is moderated by sleep reactivity.

Methods: 1,225 adults with a history of good sleep (Mage = 53.2 years, 68% female, 83% white) were recruited nationwide for an online study on sleep health. Participants completed surveys to assess sleep reactivity (baseline), sleep patterns (daily sleep diaries), and stressful life events (weekly survey). This high-density data (daily/weekly measures) allowed for a close examination of whether sleep reactivity predicts acute insomnia and how the association between stressful life events and sleep disturbance varies as a function of sleep reactivity. Due to the high variability of stressful life events and sleep over time, frequent data points were needed to test this etiological model of insomnia. Sleep diary data were used to identify sleep initiation/maintenance difficulties, including whether they met criteria for acute insomnia at any point during the one-year interval.

Results: Participants with high sleep reactivity, compared to low sleep reactivity, were at 76% increased odds of developing acute insomnia during the one-year interval. In general, greater weekly stressful life events were associated with greater insomnia during the subsequent week. Additionally, those participants with high sleep reactivity demonstrated a

stronger relationship between weekly stressful life events and insomnia, such that they reported the greatest levels of insomnia following weeks where they experienced a greater number of stressful life events.

Conclusion: These results further support the sleep reactivity model of insomnia, and specifically, provide evidence that sleep reactivity predicts the incidence of acute insomnia in a sample of participants with no history of insomnia.

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0329

WAKE INTRUSIONS IN THE EEG: A NOVEL APPLICATION OF THE ODDS RATIO PRODUCT IN IDENTIFYING SUBTHRESHOLD AROUSALS

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Introduction: Arousal scoring is controversial, due to its lack of objectivity and dependency on other intrinsic characteristics of sleep. Conventional arousal measurements have not consistently predicted insomnia severity. The present study used a novel application of the Odds Ratio Product (ORP), a measure of sleep depth ranging from 0 (deep sleep) to 2.5 (fully awake), to identify subtle wake intrusions in sleep (i.e., subthreshold arousals). We assessed whether these intrusions are better predictors of frequent insomnia symptoms when compared to conventional arousal measurements.

Methods: Using cross-sectional data from the Sleep Heart Health Study with high-quality ORP data (SHHS1; n = 5,771), accessed through the National Sleep Research Resource, we defined 'wake intrusions' as the number of times the ORP spiked above a wake threshold of 2.0 (99% agreement in wake scoring among sleep scorers) during sleep. The wake intrusion index (WII) was derived by calculating the quotient of the number of intrusions by total sleep time. Insomnia was defined from self-reported frequency of >15x/month of insomnia symptoms: delayed sleep onset, difficulty maintaining sleep, and/or early morning awakenings (n = 617). Linear models were used to examine the associations between insomnia and WII, as well as arousal index. Analyses were adjusted for age, sex, body mass index (BMI), and apnea-hypopnea index (AHI).

Results: There was a weak, but significant correlation between conventional arousal index and WII (r=0.25, 95%CI [0.22, 0.27], p< 0.001). After adjusting for age, sex, BMI and AHI, frequent insomnia symptoms were associated with WII (β =9.47, 95%CI [2.07, 16.87], p=0.012), but not with arousal index (β =0.16, 95%CI [-0.59, 0.91], p=0.217).

Conclusion: Results suggest that the ORP WII may be more sensitive than the arousal index. Moreover, frequent insomnia symptoms were independently associated with WII in adjusted analysis, while not with the arousal index. The role of the ORP WII as a potential physiological marker of insomnia deserves further investigation.

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0330**BLINDED VERSES OPEN-LABEL HYPNOTIC TAPERING FOR HYPNOTIC DISCONTINUATION: A RANDOMIZED CLINICAL TRIAL**

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Introduction: Many patients have difficulties achieving hypnotic discontinuation due to anxiety that arises when they knowingly reduce their hypnotic dose or withhold it entirely. This study is testing a blinded tapering approach designed to reduce patients' anxiety during the hypnotic tapering process.

Methods: Thus far, a sample of 44 (M age = 59.1 ± 14.1 yrs.; 61.4% women) users of benzodiazepine (BZD) or newer generation benzodiazepine receptor agonists (BZRA) have enrolled in this trial and completed a 3-month post-tapering follow-up. Following baseline assessments that included completion of the insomnia severity index (ISI), these enrollees completed 4 sessions of cognitive behavioral insomnia therapy (CBTI). Subsequently they were randomized to one of two 10-week, tapering protocols wherein their medication dosage was reduced by 25% every two weeks either in a blinded or open-label manner. Medication usage was assessed and ISI scores were obtained at the end of the tapering phase and at a 3-month follow-up.

Results: A linear mixed model analysis showed only an effect for time in study on ISI scores with both tapering groups showing a significant ($F = 36.89$; $p = .0001$) decline in these scores from baseline through the 3-month follow-up. By the 3-month follow-up, a slightly, albeit non-significantly, higher proportion of the blinded tapering group (76.2%) were no longer using their BZD/BZRA hypnotics than in the open label group (60.9%). However, there was a significantly higher BZD/BZRA discontinuation rate by the 3-month follow-up among those who achieved ISI score-determined insomnia remission than among unremitted participants both for the sample as a whole (85% vs. 54.2%; $p = .05$) and for the open label group (88.9% vs. 42.9%; $p = .0397$) considered separately. This difference between remitted and unremitted participants was not seen in the blinded tapering group.

Conclusion: Early findings in this trial suggest a slight advantage to blinded over open label hypnotic tapering in achieving hypnotic discontinuation. Moreover, insomnia remission may not be essential for hypnotic discontinuation when blinded tapering is conducted.

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0331**EFFECTS OF COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA (CBTI) ON DAYTIME COGNITIVE FUNCTIONING: A REPORT FROM THE AIR TRIAL**

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Introduction: Prior studies have shown that CBTI improves patient reported outcomes including daytime fatigue, mood

status and quality of life, yet there are limited data concerning the effects of therapy on objective measures of daytime function. The current study tested the effects of CBTI on measures derived from the psychomotor vigilance test (PVT) in a sample of patients with comorbid insomnia disorder and sleep apnea.

Methods: Patients with insomnia and comorbid OSA, who were prescribed PAP therapy ($N = 155$; M age = 56.8 ± 12.5 yrs.; 58.1% women) were randomized to digital CBTI (dCBTI) or Sleep Hygiene (CTRL). They completed PVT at baseline and after 8 weeks of treatment. Patients in the dCBTI arm who reached remission were offered no additional insomnia treatment, whereas those who did not were randomly assigned to 8 weeks of continued access to dCBTI or to a therapist delivered CBTI. Patients again completed the PVT after this second 8-week treatment phase. PVT outcome measures included mean reaction time, attentional lapses and efficiency scores. Linear mixed models were used to compare the PVT measures of patients receiving either of the CBTI treatment sequences with those assigned to the CTRL.

Results: Analyses showed significant group x time interactions for PVT attentional lapses ($F = 3.04$; $p < .05$) and for efficiency scores ($F = 4.06$; $p < .025$). Those who received either of the CBTI treatment sequences showed a greater reduction in attentional lapses and greater improvement in their efficiency scores from baseline to the post-treatment assessments than did those assigned the CTRL.

Conclusion: Findings indicate that CBTI improves objective indices of daytime cognitive functioning among those with comorbid apnea and insomnia disorder. Further tests of CBTI's effects on these and other measures of cognitive functioning are warranted in other samples of insomnia patients who do and do not have medical, psychiatric and sleep disorder comorbidities.

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0332**IMPROVING SLEEP WITH CONTINUOUS THETA BURST TRANSCRANIAL MAGNETIC STIMULATION (TMS) OF THE DEFAULT MODE NETWORK**

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Introduction: Chronic insomnia is a disorder associated with increased cognitive arousal. Insomnia is also associated with activation/connectivity within the default mode network (DMN) of the brain, consistent with the hyperarousal theory. We hypothesized that suppression of the DMN with a type of repetitive transcranial magnetic stimulation (rTMS) known as continuous theta burst stimulation (cTBS) would lead to improved overnight sleep.

Methods: Twenty participants (12 female; age = 26.9, SD = 6.6 years) meeting criteria for insomnia/sleep disorder completed a counterbalanced sham-controlled crossover study in which they served as their own controls on two separate nights of in-laboratory polysomnography (PSG) monitored sleep.

In-lab visits occurred on separate weeks at least 5 days apart. Sessions included two resting state functional magnetic resonance imaging (fMRI) sessions separated by a brief 40 second cTBS rTMS session applied over an easily accessible cortical surface node of the DMN located at the left inferior parietal lobe. After scanning/stimulation, participants were allowed an 8-hour sleep opportunity from 2300 to 0700 monitored with PSG.

Results: One session of active cTBS significantly altered functional connectivity ($p < .05$, FDR corrected) within the DMN, while the sham condition produced no changes in functional connectivity from pre- to post-treatment. After controlling for age and IQ, active treatment was associated with significant ($p < .05$) improvements in PSG measured Total Sleep Time (TST; $\eta^2 = .28$), latency to Slow Wave Sleep (SWS; $\eta^2 = .23$), Sleep Efficiency (SE; $\eta^2 = .28$), and a lower Arousal Index ($\eta^2 = .22$). Overall, individuals obtained 16 minutes more sleep after active cTBS compared to sham. Moreover, changes in brain connectivity following cTBS significantly ($p < .05$) predicted sleep outcomes, including TST, sleep latency, SE, minutes of wake, SWS, number of awakenings, arousals, and arousal index, and a trend toward increased REM ($p = .06$).

Conclusion: A brief targeted 40-second stimulation with cTBS altered DMN brain functioning, and improved PSG measured sleep outcomes during the night following stimulation. The effect sizes often exceeded those reported for other established treatments such as cognitive behavioral therapy for insomnia or hypnotic sleep medications. Further work involving multiple stimulations over several days or weeks will be necessary to demonstrate the potential utility of this approach as a treatment for insomnia.

Support (if any): W81XWH2010173

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0333

INSOMNIA WITH OBJECTIVE SHORT SLEEP DURATION IS ASSOCIATED WITH INCIDENT CARDIOVASCULAR AND/OR CEREBROVASCULAR DISEASE

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Introduction: Insomnia with objective short sleep duration (ISSD) has been associated with adverse cardiometabolic outcomes, including hypertension and diabetes. However, data on the association between ISSD and the development of cardiovascular and/or cerebrovascular disease (CBVD) are limited. We aimed to examine whether ISSD is associated with incident CBVD.

Methods: 1,211 men and women from the Penn State Adult Cohort (56.9% women, 51.82 ± 12.85 years) without CBVD at baseline were followed up for 9.21 ± 4.08 years. Based upon clinical history and physical examination, we defined the presence of CBVD as a history of diagnosis or treatment of heart disease and/or stroke. Insomnia was defined as a complaint of insomnia with a duration ≥ 1 year. Poor sleep was defined as a complaint of difficulty falling asleep, staying asleep, nonrestorative sleep or early morning awakening. Objective short sleep duration was defined as < 6 -hours sleep based on a 1-night, 8-hours, in-lab polysomnography. Logistic regression

models examined the odds of incident CBVD, while simultaneously adjusting for race, sex, age, BMI, smoking, alcohol use, physical and mental health problems, sleep-disordered breathing and follow-up duration.

Results: Compared to normal sleepers with normal sleep duration, the highest risk of incident CBVD was in the ISSD group ($OR = 2.68$, $95\%CI = 1.17-6.14$), and the second highest in normal sleepers with short sleep duration ($OR = 1.65$, $95\%CI = 1.10-2.49$). The risk for incident CBVD was not significantly increased, in poor sleepers or those with insomnia with normal sleep duration (INSD).

Conclusion: Our findings indicate that the combination of short sleep duration with the complaint of chronic insomnia (ISSD) is associated with an additive effect on incident heart disease and stroke. These data add to the cumulative evidence supporting the existence of two insomnia phenotypes and that ISSD is the more severe biological phenotype of the disorder associated with physiologic hyperarousal and cardiovascular morbidity. The diagnostic and treatment implications of insomnia phenotyping based on objective sleep duration will be discussed.

Support (if any):

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0334

INSOMNIA WITH OBJECTIVE SHORT SLEEP DURATION IS ASSOCIATED WITH METABOLIC SYNDROME

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Introduction: Several studies have shown that the insomnia with objective short sleep duration (ISSD) phenotype is associated with stage 2 hypertension and type 2 diabetes. We aimed to determine if there is an association between ISSD and metabolic syndrome (MetS).

Methods: We studied 1,741 adults from the Penn State Adult Cohort (age 20-88 years, 52.3% female, 12.4% racial/ethnic minority) who underwent a 1-night polysomnographic (PSG) evaluation, clinical history, and physical examination. Insomnia was defined as a complaint of insomnia with a duration ≥ 1 year, while poor sleep was defined as a complaint of difficulty falling asleep, staying asleep, nonrestorative sleep or early morning awakening. Objective short sleep duration was defined as < 6 -hours. MetS was defined by the presence of 3 or more of: $BMI \geq 30$ kg/m², elevated total cholesterol (≥ 200 mg/dL), triglycerides (≥ 150 mg/dL), fasting glucose (≥ 100 mg/dL), or treatment, and blood pressure ($\geq 130/85$ mm Hg) or treatment. Logistic regression models examined the odds of developing MetS, while simultaneously adjusting for sex, race, age, alcohol, smoking, sleep-disordered breathing, mental and physical problems, and sampling weight.

Results: Compared to normal sleepers with normal sleep duration, ISSD was associated with a significantly increased risk of MetS ($OR = 2.04$, $95\%CI = 1.13-3.70$), while insomnia with normal sleep duration (INSD) was not ($OR = 1.03$, $95\%CI = 0.53-1.99$). Neither normal sleepers with short sleep duration nor poor sleeper with normal or short sleep duration were associated with increased risk of MetS. Further analysis of the clustering of the cardiometabolic risk factors revealed

that in the ISSD group who had MetS, 94% had elevated blood pressure, 78% had elevated cholesterol, 72% had insulin resistance, 53% had elevated triglycerides, and 53% had BMI ≥ 30 kg/m².

Conclusion: These data indicate that hypercholesterolemia, but not hypertriglyceridemia or obesity, contributes to the association of ISSD with MetS. These data suggest that in addition to the previously-identified elevated blood pressure and insulin resistance, treatment of hypercholesterolemia in patients with ISSD may prevent the development of cardiovascular and cerebrovascular disease.

Support (if any):

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0335

PERSISTENCE OF SLEEP DURATION PHENOTYPES ACROSS NIGHTS OF LABORATORY AND HOME SLEEP RECORDING

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Introduction: Vgontzas and colleagues have proposed dividing the population of persons with insomnia disorder into short (< 6 hours/night) and normal (> 6 hours/night) sleep duration phenotypes based on their objective sleep duration as measured by one or more nights of polysomnography (PSG). However, first night effects, homeostatic recovery mechanisms and the site where PSG is conducted may all affect the sleep duration observed on individual PSG nights. The current study evaluated the stability of objective sleep duration phenotyping across multiple laboratory and home-based PSG recordings.

Methods: Seventy-six adults (Mean = 51.8 $\pm$ 16.5 yrs.; 50% women) with an insomnia disorder underwent a series of three PSG recordings in the sleep lab and three in their homes in a counterbalanced order. Participants chose their own bed and rising times each night to produce results representative of their usual sleep patterns. Participants were classified into short (ISS: TST < 6 hours) and normal (INS: TST > 6 hours) duration phenotypes using the mean sleep times across all nights.

Results: Twenty-eight participants were classified as the ISS phenotype and 48 were classified as the INS phenotype with equal numbers of men and women in each group. A linear mixed models analysis showed only significant main effects for phenotype classification ($F = 119.72$; $p < .0001$) and recording night ($F = 4.29$; $p < .025$). The ISS mean TST was 326.8 minutes whereas the INS mean TST was 396.8 minutes. Mean TST across both groups was significantly shorter on the first PSG night (Mean = 353.0 min.) across settings than on night 2 (Mean = 372.4 min.). The majority of the ISS group (78.6%) and INS group (77.1%) had TST < 6 hours and TST > 6 hours, respectively, on 4 or more nights of sleep recordings.

Conclusion: ISS and INS sleep duration phenotypes have relative stability in their objective sleep times across nights and recording sites. These findings support the growing literature suggesting the distinctiveness of these subtypes of insomnia disorder.

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0336

TELE-SELF CBTi: RESULTS OF A RANDOMIZED CONTROLLED TRIAL OF A NURSE-SUPPORTED SELF-MANAGEMENT INTERVENTION FOR INSOMNIA DISORDER

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Introduction: Approximately half of all Veterans meet diagnostic criteria for Insomnia Disorder. Cognitive Behavioral Therapy for Insomnia (CBTi) is recommended as first-line treatment but access is limited. Self-help CBTi could increase patient access and is more effective with provider support. Self-help CBTi has not been evaluated in those with significant mental health morbidity or Veterans; a population having greater medical and mental health morbidity and more severe sleep difficulties than non-Veterans.

Methods: Treatment-seeking Veterans were randomly assigned to 6 sessions of Tele-Self CBTi or Health Education Control (HEC). Nurses without sleep medicine experience were trained to deliver Tele-Self CBTi; the combination of provider support plus professionally designed patient and provider CBTi treatment manuals developed through an iterative process integrating expert and patient feedback. Both arms received nurse phone contacts (≤ 20 minutes). Outcomes including insomnia severity, subjective and objective sleep parameters, fatigue and mood were assessed at baseline, post-treatment (8 weeks), and 6 months.

Results: Study participants ($N=178$) were 55 years of age ($SD=13$), mostly male (72%), with a mental health condition (83%), and about half African American (43%) and half Caucasian (49%). At post-treatment, Veterans randomized to Tele-Self CBTi realized greater reductions in insomnia severity (ISI estimated mean improvement 5.7 vs 2.0, $p < .001$) and greater improvements in fatigue and depression symptoms ($ps < .04$). At 6 months, ISI findings were sustained (5.3 vs. 2.4, $p < .001$) and more Tele-Self CBTi than HEC participants (32% vs 10%) scored below the cutoff suggestive of insomnia disorder ($ISI < 11$) ($p = .001$). Preliminary findings also suggest better post-treatment outcomes for Tele-Self CBTi on sleep diary SOL (25 vs 45 minutes) and WASO (34 vs 55 minutes).

Conclusion: A self-management CBTi requiring minimal provider resources was effective in reducing insomnia severity in veterans with considerable mental health co-morbidity. Tele-Self CBTi can help bridge the gap between unavailable resources and high demand for services and can serve as the entry level in stepped-care treatment for insomnia disorder. Future research is needed to identify characteristics of patients most likely to benefit from Tele-Self CBTi.

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0337

24-MONTH PATTERNS OF SLEEP MEDICATION USE WITH A PRESCRIPTION DIGITAL THERAPEUTIC FOR CHRONIC INSOMNIA – A RETROSPECTIVE ANALYSIS

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Introduction: Cognitive-behavioral therapy for insomnia (CBT-I) is the recommended first-line treatment, but sedative-hypnotic medications are often used first, despite contraindications and risk of misuse. This study assessed change in sedative/hypnotic use/dosage in patients with chronic insomnia treated with Somryst® (tested as SHUTi), a prescription digital therapeutic (PDT) delivering CBT-I.

Methods: A retrospective claims data analysis was conducted with chronic use of prescribed sedatives/hypnotics (days' supply: 8-200; units dispensed: >12) in patients with self-identified sleep problems who initiated the PDT (index) between June 2016 and December 2018, and who had available closed claims data 24 months pre- and post-index. Eligible medications were used at least once in the year prior to initiation of the PDT, or 90 days after PDT initiation. Outcomes evaluated: dose change, stoppage/initiation, or medication switch, using nearest pre-index medication and furthest post-index medication. Dose change was evaluated using total strength per day: medication dose quantity dispensed/day's supply. Medication switch was evaluated as post-index cessation of a pre-index medication, accompanied by a post-index initiation of a different sedative/hypnotic.

Results: Of the 248 individuals observed, 131 (52.8%) utilized an eligible sedative/hypnotic medication. On average, individuals were on 1.5 (median of 2, range 1-6) sedative/hypnotic medications. In 59 individuals (45% of the cohort), there was either a decrease in dosage (13 patients, 9.9%), a full stopping of a medication (52 patients, 39.7%), or a stopping of all medications (41 patients, 31.3%). In 32 individuals (24% of the cohort), there was either an increase in dosage (8 patients, 6.1%) or an initiation of a new medication (28 patients, 21.3%). Twenty-two patients (16.7%) switched to a different medication in the post-index period. Forty-three patients (32%) experienced no changes in a specific medication and its dosage, including 25 (19%) patients who had another medication already counted in the groups described above, and 18 (13.7%) patients not counted elsewhere.

Conclusion: Real-world evidence from a PDT delivering digital CBT-I demonstrated dose reduction and/or stoppage of sedative/hypnotic medications in almost half of the population, with almost a third of patients stopping all such medications.

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0338

A NATURALISTIC WITHIN AND BETWEEN SUBJECTS COMPARISON OF THE EFFECTS OF CANNABIS ON SLEEP AMONG YOUNG ADULT, AFRICAN AMERICANS

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Introduction: Cannabis use is increasing, despite limited knowledge of its potential benefits and adverse effects. Reducing sleep disturbance appears to be a frequent motivation for nighttime

cannabis use yet its effects on sleep are poorly documented. We leveraged data from an observational study of urban residing young adult African Americans where pre-bedtime cannabis use was variably endorsed with digital ecological momentary assessment (EMA) to conduct within and between subjects' comparisons of sleep with and without preceding cannabis use.

Methods: Participant were recruited from an ongoing observational study that enrolls African Americans living in urban environments. 20 participants endorsed cannabis use on some but not all nights and were included in the within subjects' comparison. 25 participants who used cannabis on 2 or more nights were compared with 28 participants who did not endorse prebedtime substance use. Total sleep time (TST), and wake after sleep onset WASO were derived from actigraphy monitoring; sleep quality (SQ) (scale: 1 "not at all rested"-10 "very rested") and time in bed (TIB) were obtained from the EMA.

Results: While TST and WASO were very similar in both conditions and groups, within subjects' SQ was superior on nights without cannabis (7.2 + 1.7 vs. 6.4 + 2.2, $t=2.2$, $p=.04$) and cannabis users spent more time in bed (minutes) than their non-cannabis using counterparts (447.6 + 77.1 vs. 373.6 + 66.1; $t= 2.4$, $p=.04$).

Conclusion: Among urban residing young African American adults, cannabis does not appear to improve sleep.

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0339

A PHENOMENOLOGICAL STUDY ON FACILITATORS AND BARRIERS OF ZERO-TIME EXERCISE IN PHYSICALLY INACTIVE ADULTS WITH INSOMNIA DISORDER

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Introduction: Zero-time Exercise (ZTE), a lifestyle-integrated exercise, might have beneficial effects on relieving insomnia. Exercise adherence is a key component for the success of exercise therapy. This study is to explore facilitators and barriers of Zero-time exercise adherence and the improvement in sleep quality in physically inactive adults with insomnia disorder.

Methods: The qualitative study used ten 1-hour focus group interviews (5 groups at immediately after training program, and groups at the end of 24-week study period) on improving sleep quality of 35 physically inactive adults with insomnia disorder who had enrolled in our previous randomized controlled trial, from Oct 2019 to Mar 2022. A framework approach with a semi-structured interview guide was used to reflect subjects' facilitators and barriers of adherence to Zero-time exercise. Different strategies were used to ensure the credibility, dependability, confirmability, and transferability of the study. Transcripts were analyzed using qualitative thematic content analysis. The interviews were audio-recorded and transcribed verbatim. In addition, the contents of each group were summarized into generalized descriptions using NVivo 11.0.

Results: 35 physically inactive adults with insomnia disorder (female: 58.7%, mean age: 47.2 years). Four themes were identified: (1) perceived benefits or changes (e.g. perceived better sleep

quality; perceived improved physical health and more energetic, and positive lifestyle changing), (2) facilitators to intervention delivery (e.g. the understanding of benefits of doing exercises and risks of not doing exercise, expectations of participants, monitoring and reminders provided in the study, and belief and responsibility of participation), (3) barriers to intervention delivery (e.g. difficulties in integrating exercises into daily life, physical health challenges faced by participants, limited improvement, and lack of support from people around) and (4) suggestions from participants (e.g. modifying the content of ZTEx to be more interesting; and providing more easily accessible exercise video).

Conclusion: Participants perceived benefits from the ZTEx intervention besides improving sleep quality. Participants' compliance could be further enhanced if more assistance in helping them to integrate exercise into daily life. Social and familial support was also essential for their adherence.

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0340

AASM INSOMNIA SUMMIT 2022

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Introduction: Significant challenges exist in access to high-quality care for insomnia disorder. After the recent publication of clinical practice guidelines on behavioral/psychological treatments for insomnia in adults, the American Academy of Sleep Medicine (AASM) hosted a virtual one-day summit in September 2022 to discuss improving care for patients with insomnia disorder.

Methods: Fifty attendees representing a variety of organizations (e.g., medical, psychological, and nursing associations; patient advocacy groups; and federal institutions) participated in the Summit. Videos highlighting patient perspectives and an overview of current insomnia disorder treatment guidelines were followed by thematic sessions: (1) barriers to care, (2) facilitators of high-quality care, and (3) future directions and innovations. After 3-4 brief topical presentations by content experts, summit participants divided into seven breakout groups to brainstorm and prioritize issues. Each breakout highlighted 3-5 priorities and reported back to the broader group following each thematic session.

Results: The top barriers to care for insomnia disorder identified by summit participants included (1) limited access to care, (2) limited awareness of insomnia treatment options, (3) limited treatment formats, (4) low perceived value of insomnia treatment, and (5) insufficient number of trained clinicians to provide care. The top facilitators of care included (1) increased education and awareness, (2) novel models to increase access to care, (3) developing and expanding the insomnia patient care workforce, (4) incorporating research into practice, and (5) increasing reimbursement. Top priorities for future directions included (1)

increasing awareness among patients and healthcare providers, (2) increasing the number of skilled behavioral sleep medicine providers, (3) increasing advocacy efforts to address insurance issues (e.g., billing, reimbursement, and performance measures), and (4) working collaboratively with multidisciplinary organizations to achieve common goals for insomnia disorder care.

Conclusion: The AASM and participants from partnering organizations successfully engaged in a summit and identified prioritized strategies to improve access to high-quality care for insomnia disorder across diverse clinical settings (e.g., private practice, academic institutions, and rural areas). The priorities are to improve access to care for insomnia disorder, which require advocacy efforts to increase awareness of treatment options, improve reimbursement, and grow the skilled workforce for treating insomnia disorder.

Support (if any): AASM

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0341

ACUPUNCTURE AND ITS EFFECTS ON VARIOUS PATTERNS OF INSOMNIA

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Introduction: Acupuncture has been shown to treat Insomnia. Insomnia is classified as difficulty falling asleep and staying asleep, waking up throughout the night, and waking up early, which is associated with decreased daytime function, mental health, and cardiometabolic health. The purpose of our study is to describe a series of 12 cases seen in an Acupuncture Clinic in Tampa for symptoms of Insomnia.

Methods: We used intakes from eight females, seven Caucasians, one African American, and four Caucasian males aged 30-65 and assessed information through Acupuncture systems. Patients were seen for Insomnia along with other treatable symptoms between January 2019 and October 2022. Information on Gynecological, Orthopedic, Genito-Urinary, Psycho-Emotional, Gastrointestinal, Respiratory, Ear/Nose/Throat, Neurological, Endocrine, and Allergic/Immunologic were collected. Follow-up intake information and Subjective, Objective, Assessment Plan (SOAP) notes were conducted during each visit through the electronic medical system. Differential diagnosis, as well as ICD codes, are housed within the system. The Acupuncture method utilized was Traditional Chinese Medicine (TCM) and not dry needling, which does not include a differential diagnosis and is typically used for Orthopedic conditions.

Results: We retrieved data from twelve patients, eight women and four men receiving Acupuncture treatment in private practice. The mean age of the sample was 46.91 [30-65] years. Of the 12 patients, 10 of them fully recovered after treatment. Among those who fully recovered, treatments ranged as low as two up to 14, with three patients receiving six treatments and one receiving 14. One patient discontinued treatment after six treatments with a slight change to differential insomnia pattern. One patient received fourteen treatments with only partial remission to differential insomnia pattern.

Conclusion: Acupuncture may be an effective modality in treating Insomnia, regardless of the pattern. Further studies are necessary to determine the mechanism of action.

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0342

ARE CLINICAL TRIALS FOR INSOMNIA RECRUITING REAL WORLD PATIENTS?

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Introduction: Studies that have resulted in recent approval of hypnotics for chronic insomnia disorder (CID) have extremely restrictive inclusion criteria. We sought to determine how many patients seen in a sleep medicine clinic would be eligible to participate in these trials in order to assess the generalizability of these findings to clinical populations.

Methods: Six-hundred and twenty-eight patients were screened to identify 100 patients who were ≥18 years old, had a diagnosis of CID, and were prescribed a hypnotic medication at a sleep medicine clinic in a quaternary level healthcare center. Information regarding age, sex, body mass index, comorbid diagnoses, sleep schedule, medications, alcohol/tobacco/illicit drug use, caffeine intake, as well as Epworth Sleepiness Scale, Generalized Anxiety Disorder-7, Patient Health Questionnaire-9, and Insomnia Severity Index scores were abstracted. These data were compared against the inclusion and exclusion criteria for recent regulatory Phase III trials of orexin receptor antagonists (suvorexant, lemborexant, daridorexant).

Results: Of the 100 patients with CID (mean age=56.2 years; 57% female), only 3 patients met eligibility criteria for inclusion. A majority of patients (80%) would have been excluded due to a prior/concurrent trial of cognitive behavioral therapy for insomnia. If this criterion was set aside, only 11 patients would have been eligible to participate. The remaining top reasons for potential exclusion from the regulatory trials were: presence of medical comorbidities (36%), daytime napping (33%), and sleep apnea (30%).

Conclusion: A very small number of patients with CID seen in a clinical setting met eligibility criteria for clinical trials of hypnotic medications resulting in regulatory approval. This substantially limits the generalizability of findings from these trials and restricts our ability to determine the efficacy of these drugs in clinical populations. Future trials should enroll patients with less restrictive criteria to help determine the effectiveness of these medications in real world settings.

Support (if any):

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0343

ASSOCIATION BETWEEN THE REAL-WORLD USE OF TRAZODONE AND DAYTIME IMPAIRMENT IN US PATIENTS WITH INSOMNIA

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Introduction: Trazodone is approved for the treatment of depression and is used off-label to treat insomnia despite Clinical Practice Guidelines recommending against this use. The objective of this real-world retrospective study is to explore whether trazodone use is associated with improvements in daytime impairment in US patients with insomnia.

Methods: Information on insomnia patients aged ≥ 18 years prescribed trazodone as first-line treatment between October 2015 and March 2020 was retrieved from HealthVerity. Insurance claims data were extracted for each patient alongside physician notes in free-text form. From the claims, patient demographics and prescription information were extracted. An ontology analogous to the Insomnia Daytime Symptoms and Impact Questionnaire (IDSQ) was designed with three domains (i.e., alert/cognition, mood and sleepiness). The 14 IDSQ terms were extended to 109 terms to reflect physicians' language. Daytime impairment symptom frequency occurring from 182 days before treatment to ~3 months (mean) during treatment was measured as annualized rates normalized by one year as the duration before and during treatment is different. Each symptom noted in a visit is counted once in a specific domain. Results were stratified by dose: trazodone < 150mg (typically used for off-label insomnia treatment) and trazodone ≥150mg (approved dose for depression treatment).

Results: 1187 and 246 unique patients were identified on the < 150mg and ≥150 mg trazodone doses, respectively. For trazodone < 150mg, the annualized rate of daytime impairment symptoms before and during treatment was 139.4 and 147.5, respectively, with a statistically non-significant overall increase (6%, p=0.313) and statistically non-significant increases in each domain (alert/cognition: 4%, p=0.574; mood: 10%, p=0.173; sleepiness: 5%, p=0.401). For ≥150mg trazodone, the annualized rate of daytime impairment symptoms before and during treatment was 143.5 and 142.2, respectively, with a statistically non-significant overall decrease (1%, p=0.941), statistically non-significant decreases in the alert/cognition (19%, p=0.128) and sleepiness (5%, p=0.712) domains and statistically non-significant increase in the mood domain (14%, p=0.400).

Conclusion: Patients with insomnia prescribed trazodone show similar levels of daytime impairment before and during treatment. This study suggests that the use of trazodone in patients with insomnia is not associated with a decrease in daytime impairment.

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0344

BEHAVIORAL TREATMENT OF INSOMNIA WITH CONCURRENT NOCTURIA

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Introduction: Behavioral therapy has proved effective for insomnia in older adults. However, its efficacy has not been examined among those with nocturia (awakening to urinate) which is the most common cause of insomnia in this age group. Thus we assessed the impact of behavioral sleep treatment on sleep in older adults with nocturia.

Methods: Fifty-six community-dwelling older adults (mean age, 72±6 years; 64% women) with nocturia frequency ≥2 per night were randomized to receive Brief Behavioral Treatment for Insomnia (BBTI) or information-only control (IC). We determined the impact of BBTI on sleep, sleep quality, and nocturia as assessed by a 3-day voiding and sleep diary. Participants concurrently wore a single-channel, EEG device Z-machine® for objective in-home sleep assessment.

Insomnia Severity Index (ISI) was used to assess insomnia symptoms.

Results: Participants had a mean nocturia frequency of 2.2 ± 0.7 /night at baseline. Time in bed (TIB) decreased by 42 ± 76 minutes among the BBTI group, but total sleep time (TST) increased by 20 ± 95 . Significant differences $\pm$ standard error between BBTI and IC in pre- to post-intervention changes were observed for TIB (-41 ± 18 minutes, $p=.03$) but not TST (27 ± 18 , $p=.14$). Compared to the IC group, the BBTI group also showed a greater improvement in ISI (-3.3 ± 1.4 , $p=.02$) as well as objectively measured sleep onset latency (-9.8 ± 3.5 , $p=.008$), latency to deep sleep (-19 ± 11 , $p=.08$), and percentage of total sleep time spent in deep sleep (8.4 ± 3.1 , $p=.01$). BBTI also decreased nocturia frequency to a greater extent (-0.49 ± 0.20 , $p=.02$)

Conclusion: BBTI improves insomnia symptoms, objective sleep measures, and nocturia in older adults with frequent sleep interruptions related to nocturia. Treatment for insomnia may be an important addition to current treatments for nocturia.

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0345

BZRA HYPNOTIC RECEPTOR SPECIFICITY AND ABILITY TO DISCONTINUE CHRONIC HYPNOTIC USE

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Introduction: Clinicians prescribing hypnotics remain concerned regarding the inability to discontinue hypnotics after chronic use. In a controlled prospective study using self-administration choice procedures we tested whether BZRA hypnotic receptor specificity is predictive of discontinuation difficulty in a clinical trial in which insomnia subjects are instructed to stop taking their study medication after 6 months of nightly use.

Methods: DSM-V diagnosed insomnia subjects, aged 23-61 yrs, ($n=41$, 36 females), with no other sleep disorders, unstable medical or psychiatric diseases or drug dependency completed the trial. Following a screening polysomnogram and MSLT, participants were randomized to zolpidem XR 12.5 mg ($n=16$), eszopiclone 3 mg ($n=11$), or placebo ($n=14$) nightly for 6 months. After 6 months, nightly use, over a 2-week choice period, they were instructed to discontinue hypnotic use, but if necessary, to self-administer either 1, 2, or 3 capsules of their assigned "blinded" medication (zolpidem XR 6.25 mg, 6.25 mg, placebo; eszopiclone 2 mg, 1 mg, placebo as capsules 1, 2 and 3 respectively; or 3 placebos).

Results: Over the 14 nights 21 subjects took zero (51%) capsules; among the 20 taking capsules the median total number chosen over the two weeks was 3. Most took one capsule per night; 6 took > 1 capsule on a given night. Overall, the number of capsules taken declined from week 1 to 2 ($p<.001$). The eszopiclone group took a greater number of capsules than the placebo group ($p<.005$), with the zolpidem group between. The eszopiclone group also showed a trend ($p<.07$) to fail to reduce use from week 1 to 2.

Conclusion: The majority (51%) of the participants discontinued 6-month nightly hypnotic use and among those taking capsules the rate declined from week 1 to 2. The non-hypnotic receptor specific eszopiclone group took a greater number of capsules than the placebo group. This is the first demonstration of differential abuse liability among BzRA hypnotics.

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0346

CANNABINOL (CBN) EFFECTS IN INSOMNIA DISORDER: A RANDOMISED, DOUBLE-BLIND, PLACEBO-CONTROLLED, CROSSOVER, CLINICAL TRIAL PROTOCOL.

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Introduction: There is a clear need for novel interventions for insomnia disorder. Growing evidence suggests a role of the endogenous cannabinoid system in regulating circadian sleep-wake cycles, highlighting a potential avenue for novel therapeutics. Cannabinol (CBN), a trace cannabinoid formed through oxidation of delta-9-tetrahydrocannabinol (THC), is hypothesised to impact sleep. Despite anecdotal and preclinical evidence, the effects of CBN isolate on sleep have never been examined through well-designed clinical trial procedures.

Methods: This randomised, double-blind, placebo-controlled, three-arm, crossover, single-site, pilot study will investigate the acute effects of oral dose CBN at 30 and 300 mg in twenty patients with clinician-diagnosed insomnia disorder (and Insomnia Severity Index [ISI] Score ≥ 15). Across three treatment sessions, each separated by two-weeks washout, participants will receive two doses of CBN and matched placebo, at random. Participants will undergo overnight sleep assessment using in-laboratory polysomnography and next-day neurobehavioral function tests. The primary outcomes are CBN (30 and 300 mg) effects on sleep continuity (wake after sleep onset minutes), compared to placebo, measured using polysomnography.

Results: Secondary outcomes include changes to sleep micro-architecture, traditional sleep staging, and absolute spectral power during non-rapid eye movement sleep. Various other subjective and objective safety measures will be obtained.

Conclusion: This study will provide novel preliminary data on the effects of CBN on sleep and next-day function in adults living with insomnia disorder which will inform the design of larger clinical trials.

Support (if any):

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0347

CBT-I LEADS TO CHANGES IN ACTIGRAPHY AND SLEEP DIARY-ASSESSED SLEEP PARAMETERS IN VETERANS WITH PSYCHOSIS AND INSOMNIA

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Introduction: Up to 80% of people with psychosis have insomnia. While insomnia worsens psychotic symptoms and functioning, treating insomnia may improve functioning and recovery. Cognitive Behavioral Therapy for Insomnia (CBT-I) is an effective treatment, but there is limited research on CBT-I in people living with psychosis. We developed guidelines and materials for conducting CBT-I with people with psychosis and evaluated actigraphy and sleep diary-measured outcomes in Veterans who participated in an RCT of CBT-I for psychosis.

Methods: Forty-seven Veterans with insomnia and psychosis were randomized to either CBT-I using novel psychosis-specific guidelines and materials (n=26) or to an active treatment control, the Health and Wellness (HW) intervention (n=21). Participants completed both actigraphy and daily sleep logs for two weeks at baseline, post-treatment, and 3-month follow-up.

Results: Using a mixed effects model for repeated measures, mean change from baseline at post and follow-up was compared for CBT-I for psychosis and HW. For actigraphy-measured total sleep time (TST) and time in bed (TIB), and diary-measured TIB, there was a significant decrease in these parameters for the CBT-I group relative to an increase for HW at post ($t(1082)=-2.41$, $p=.016$, $d=-.38$; $t(1082)=-2.19$, $p=.029$, $d=-.44$; $t(1318)=-3.19$, $p=.002$, $d=-.70$, respectively) and in diary-measured TIB at follow-up ($t(1318)=-1.97$, $p=.049$, $d=-.37$). Sleep diary-measured sleep efficiency (SE) increased significantly more in CBT-I than in HW ($t(1266)=1.99$, $p=.047$, $d=.54$) at post. There were no group differences in actigraphy-measured SE, sleep onset latency (SOL), or WASO, or sleep diary-measured TST, SOL, WASO, or number of awakenings at post. There were no other group differences for actigraphy- or diary-measured sleep variables at follow-up, though underpowered due to sample size at the follow-up timepoint.

Conclusion: Results indicate that CBT-I tailored to the needs of people with psychosis can change several actigraphy- and diary-assessed common sleep variables of interest--TST, TIB, and SE. CBT-I for psychosis should be further investigated with a larger randomized controlled trial over a longer time period.

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0348

COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA IN AFRICAN AMERICANS: A PILOT STUDY

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Introduction: Co-morbid sleep continuity disturbance (SCD) and insufficient sleep duration (ISD) disproportionately affect the sleep health of Black Americans (BA). Simultaneously, treating SCD and ISD may improve health and reduce disparities experienced by this community. Although standard cognitive behavioral therapy for insomnia (CBT-I) ranges from six to eight sessions and directly addresses SCD, standard CBT-I does not appreciably increase total sleep time (TST) and therefore does not adequately address ISD during treatment. This report presents the overall study outcomes of CBT-I (without respect to dose of CBT-I) in BA.

Methods: Twelve BA adults (83% female, Mage 46.0±13.9yrs) were recruited from the Philadelphia area. CBT-I was provided by one of four master CBT-I therapists via telehealth for up to 16 sessions. Two follow-up assessments were conducted at 3 and 6 months. Participants completed daily measures of sleep continuity (sleep diaries) and weekly measures of insomnia severity (ISI). **Results:** Overall, 75% of participants exhibited a treatment response corresponding to a reduction of 58% (effect size [ES]=2.3) on the ISI. With respect to sleep continuity (measured in minutes), there was a 61% (ES=-1.4) reduction in sleep latency (30.1 to 11.8), 76% (ES=-1.7) reduction in wake-after-sleep onset (32.4 to 7.8), 81% (ES=-1.2) reduction in early morning awakenings (32.2 to 6.3), 7% (ES=0.3) increase in TST (381.3 to 408.0), a 9% (ES=-0.6) reduction in time in bed (476.0 to 433.7), and an overall 16% (ES=2.9) improvement in sleep efficiency.

Conclusion: Results from this pilot study indicate that standard CBT-I produces robust effects in BA with insomnia. Analyses are ongoing and will examine group interactions and treatment durability at follow-up.

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0349

CONTRIBUTION OF INSOMNIA AFTER TRAUMA TO DEPRESSION AND POSTTRAUMATIC STRESS DISORDER IN WOMEN SERVICE MEMBERS

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Introduction: Trauma can lead to mental health disorders, such as posttraumatic stress disorder (PTSD) and depression. Historically, insomnia was thought of as a secondary symptom of these mental health disorders, but current research suggests insomnia can be an independent clinical disorder and can contribute to the development and severity of PTSD and depression among civilians. However, previous studies examining insomnia and mental health symptoms among service members are limited by cross-sectional designs, reliance on retrospective data, or inclusion of predominately male samples. We prospectively examined associations among trauma exposure, insomnia, and mental health symptoms in an exclusive sample of women service members and veterans.

Methods: We analyzed 2 waves of survey data (2011-2013, Time 1 [T1], and 2014-2016, Time 2 [T2]) from 26,443 current and former women service members from the Millennium Cohort Study. We assessed recent traumas (combat experience and sexual trauma) in the past 3 years, probable insomnia at T1, and probable PTSD and depression at T2. A longitudinal mediation model was used to quantify separate indirect effects of recent traumas on mental health outcomes through probable insomnia.

Results: Women who experienced recent sexual assault (odds ratio [OR] = 1.68; 95% CI, 1.24-2.10), sexual harassment (OR = 1.22; 95% CI, 1.05-1.41), or combat (OR = 1.34; 95% CI, 1.20-1.49) at T1 had greater risk of probable insomnia at T1 compared with women who had not recently experienced these events. Probable insomnia at T1, in turn, was associated with probable depression (OR = 2.66; 95% CI, 2.31-3.06) and PTSD (OR = 2.57; 95% CI, 2.27-2.90) at T2. Recent combat experience did not moderate the associations of recent sexual trauma with insomnia or mental health outcomes.

Conclusion: Insomnia contributes to subsequent mental health symptoms following trauma. The diagnosis and treatment of post-trauma insomnia during military service should be prioritized to mitigate the development of posttraumatic mental health symptoms. Sleep health in women service members remains an understudied area of research and should also be prioritized.

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0350

DARIDOREXANT IN PATIENTS WITH INSOMNIA DISORDER: NUMBER NEEDED TO TREAT, NUMBER NEEDED TO HARM & LIKELIHOOD TO BE HELPED OR HARMED

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Introduction: Patients with insomnia disorder have difficulty initiating or maintaining sleep and have impaired daytime functioning. Daridorexant is a dual orexin receptor antagonist approved for the treatment of insomnia. This analysis reports

the number needed to treat (NNT), number needed to harm (NNH), and likelihood to be helped or harmed (LHH) with daridorexant 25 mg or 50 mg versus placebo over 3 months.

Methods: Phase 3 data from one of two pivotal trials (N=930: randomized 1:1:1 to daridorexant 25 mg, 50 mg, or placebo) were used to calculate NNT, NNH, and LHH. For the NNT analysis, wakefulness after sleep onset, latency to persistent sleep, self-reported total sleep time, the Insomnia Daytime Symptoms and Impacts Questionnaire, and the Insomnia Severity Index were explored. NNT was assessed using a range of clinically meaningful thresholds (CMTs), from minimal clinical improvement (MiCI) to marked clinical improvement. NNH analysis was performed on adverse events (AEs) occurring in >1% of participants in any treatment arm. LHH values were calculated for all NNT outcomes using the NNH estimates for somnolence and fatigue AEs.

Results: At Month 1 and 3, NNT values at MiCI thresholds for daridorexant 50 mg ranged from 5–9 and 6–12, respectively, and were all statistically significantly different versus placebo, indicating a good therapeutic response. Daridorexant 50 mg had at least one NNT < 10 for CMTs across all outcomes. NNTs at MiCI thresholds for daridorexant 25 mg ranged between 7–328 and 8–1666. NNH values for daridorexant 25 and 50 mg were negative or not significantly different from placebo, confirming a good tolerability profile. For a somnolence AE, LHH values ranged from 83.3–200 for daridorexant 50 mg versus placebo. For a fatigue AE, LHH ranged from 4.3–10.2.

Conclusion: Daridorexant 25 mg and 50 mg both have a positive benefit-risk ratio compared with placebo over 3 months. Furthermore, daridorexant 50 mg showed 'good' NNT values (i.e. NNT < 10) over all efficacy endpoints in relation to the CMTs. NNH results confirmed the good tolerability profile of both doses.

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0351

DIFFERENTIAL EFFECT OF LEMBOREXANT AND ZOLPIDEM ON WAKE ACROSS THE NIGHT IN PATIENTS WITH INSOMNIA DISORDER

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Introduction: Insomnia can involve difficulty with falling and/or staying asleep; older adults tend to report more sleep maintenance issues. While zolpidem tartrate extended-release 6.25mg (ZOL) is indicated to treat sleep onset and maintenance, data indicate that ZOL may be less effective in the last 2 hours of the night. It is important to understand the differences between ZOL and lemborexant (LEM), a dual-orexin-receptor-antagonist with the same indication. In Study 304 (E2006-G000-304; NCT02783729), LEM treatment significantly improved objective sleep maintenance (wake after sleep onset [WASO] and WASO in the second half of the night) assessed by polysomnography (PSG) over 1 month compared with placebo (PBO) and ZOL in older adults with insomnia disorder. This post-hoc analysis assessed the effect of LEM and ZOL on wake at each hour (H) of an 8-h sleep period.

Methods: Study 304 was a randomized, double-blind, PBO- and active-controlled, parallel-group study in adults ≥55y. Subjects (n=1006) received PBO, LEM 5mg (LEM5) or 10mg (LEM10), or ZOL for 1 month. Wake (minutes) was assessed

hourly from paired PSGs during single-blind PBO run-in and post-randomization at nights (NT) 1/2 and NT29/30. Change from baseline (CfB) for H1-8 was analyzed using pooled t-tests.

Results: Between-group baseline wake was similar. On NT1/2 and NT29/30, CfB for LEM10 was significantly greater (less wake) than PBO for all hours except H4 NT29/30. On NT1/2 and NT29/30, CfB for LEM5 was significantly greater than PBO for all hours except H4 NT1/2 and NT29/30 and H8 NT1/2. On NT1/2 and NT29/30, CfB for LEM5 and LEM10 were significantly greater than ZOL during H1,2,7, and 8. CfB for ZOL was not significantly different than PBO except for H2-6 NT1/2 and H3,5,6 NT29/30; CfB for PBO was significantly greater (better) than ZOL during H1 NT29/30.

Conclusion: LEM improves total sleep time by decreasing wake time throughout the night after sleep onset compared to PBO, and at the beginning/end of the night compared to ZOL. These findings support that ZOL may be less effective in maintaining sleep during the last 2 hours of the night compared with LEM in older subjects, especially those with sleep maintenance difficulties.

Support (if any): Eisai Inc.

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0352

DIGITAL COGNITIVE BEHAVIORAL THERAPY IN TREATING INSOMNIA IN OLDER ADULTHOOD: A SUB-ANALYSIS USING INDIVIDUAL PARTICIPANT DATA

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Introduction: Insomnia prevalence increases across the lifespan with rates reported as high as 40% in the over 65 yo population. Although cognitive behavioral therapy (CBT) for insomnia is the first-line recommended treatment, low accessibility leaves many older adults with less effective treatment options including medication and sleep hygiene. Medication is not recommended due to side effects, which may be more probable in older individuals. Digital CBT (dCBT) for insomnia permits access to first-line treatment; however, little is known about its effectiveness in older adults. We evaluated the effects of fully-automated dCBT on symptoms of insomnia, anxiety, and depression in adults aged 65 and older.

Methods: Individual participant data from prior randomized controlled trials of dCBT for insomnia (Sleepio) were combined for those aged 65+ (range=65-92yo) with insomnia disorder (N=486). Participants received access to dCBT or a control. As the insomnia, anxiety, and depression outcomes were assessed differently across studies, scores were standardized into z-scores. Mixed-effects models estimated the effect of treatment on the combined sleep, depression and anxiety outcomes at post-treatment and follow-up. For studies using the SCI-8, chi-squared tests evaluated insomnia remission rates between groups at post-treatment.

Results: Digital CBT led to significantly greater improvements at post-treatment and follow-up relative to control for the combined sleep ($ds \leq -1.34$, $ps < .001$) and depression ($ds \leq -0.35$, $ps \leq .001$) outcomes. For the combined anxiety outcome, dCBT led to significantly greater improvements at post-treatment ($d = -0.30$, $p = .004$). Those randomized to dCBT were more likely to achieve remission of insomnia (60% vs. 16%, $p < .001$) at post-treatment.

Conclusion: Fully-automated dCBT for insomnia is effective at improving symptoms of insomnia, anxiety, and depression in adults aged 65+. Digital CBT may therefore serve as a first-line treatment option for older adults with insomnia to improve sleep and broader mental health. Importantly, dCBT may serve as an accessible means for older adults to receive guideline concordant treatment at scale.

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0353

EFFECT OF LEMBOREXANT ON SLEEP ARCHITECTURE IN ADULT AND ELDERLY SUBJECTS WITH MILD TO SEVERE OBSTRUCTIVE SLEEP APNEA

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Introduction: Lemborexant (LEM) is a dual-orexin-receptor antagonist approved to treat adults with insomnia. In such patients, LEM increased total sleep, with prominent increases in rapid eye movement (REM). Since patients with obstructive sleep apnea (OSA) may report sleep difficulties and show decreased REM sleep, sleep architecture was analyzed after treatment with LEM.

Methods: Studies 102 and 113 were double-blind, placebo (PBO)-controlled crossover studies in adult and elderly subjects with mild (apnea-hypopnea index [AHI] ≥ 5 to < 15) or moderate (AHI ≥ 15 to < 30)/severe (AHI ≥ 30) OSA, respectively, without insomnia. Subjects were randomized to LEM 10mg (LEM10) or PBO in two 8-night treatment periods (separated by ≥ 14 days). Least-squares-mean (LSM) for each sleep stage (minutes) was compared across conditions on Days 1 (D1) and 8 (D8). Treatment-emergent adverse events (TEAEs) were recorded.

Results: The analysis set comprised 39 subjects with mild OSA and 33 with moderate/severe OSA. On both days, total sleep time was significantly higher in the LEM condition in subjects with mild (D1: LEM10, 434.08; PBO, 385.46; $P < 0.0001$; D8: LEM10, 415.90; PBO, 386.85; $P = 0.003$) and moderate/severe (D1: LEM10, 423.10; PBO, 385.48; $P < 0.0001$; D8: LEM10, 416.96; PBO, 385.57; $P = 0.001$) OSA. Compared with PBO, total non-REM sleep significantly increased only on D1 in subjects with mild OSA (D1: LEM10, 330.57; PBO, 308.55; $P = 0.001$; D8: LEM10, 323.77; PBO, 308.97; $P = 0.060$) but on both days in subjects with moderate/severe OSA (D1: LEM10, 343.23; PBO, 327.45; $P = 0.006$; D8: LEM10, 341.83; PBO, 322.48; $P = 0.018$). Total REM sleep significantly increased in subjects with mild (D1: LEM10, 103.59; PBO, 76.91; $P < 0.0001$; D8: LEM10, 92.13;

PBO, 77.93; $P=0.004$) and moderate/severe (D1: LEM10, 79.87; PBO, 58.03; $P<0.0001$; D8: LEM10, 75.13; PBO, 62.69; $P=0.006$) OSA. REM latency was significantly decreased on both days in subjects with mild OSA (D1: LEM10, 51.96; PBO, 83.36; $P<0.0001$; Day 8: LEM10, 67.52; PBO, 102.34; $P=0.005$) and only on D1 in subjects with moderate/severe OSA (D1: LEM10, 72.13; PBO, 98.90; $P=0.029$; D8: LEM10, 90.42; PBO, 106.63; $P=0.242$). LEM was well-tolerated; most TEAEs were mild.

Conclusion: In OSA subjects without insomnia, LEM nevertheless increased total sleep, non-REM, and REM sleep versus PBO.

Support (if any): Eisai Inc.

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0354

EFFECT OF LEMBOREXANT ON SLEEP ARCHITECTURE IN SUBJECTS WITH COMORBID INSOMNIA AND MILD OBSTRUCTIVE SLEEP APNEA FROM A PH 3 TRIAL

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Introduction: Many patients with insomnia have co-morbid obstructive sleep apnea (COMISA). Patients with obstructive sleep apnea (OSA) may also have decreased REM-sleep. Lemborexant (LEM) is a dual-orexin-receptor-antagonist approved to treat adults with insomnia. LEM has been demonstrated to increase total sleep, with prominent increases in rapid eye movement (REM). Thus, sleep architecture was analyzed in subjects with insomnia/mild OSA receiving LEM in a phase 3 trial.

Methods: Study 304 (E2006-G000-304; NCT02783729) was a 1-month, randomized, double-blind, placebo (PBO)-controlled and active-comparator study in adults ≥ 55 y with insomnia disorder. Subjects received PBO, LEM 5mg (LEM5), LEM 10mg (LEM10) or zolpidem tartrate extended-release 6.25mg (ZOL). Least-squares-mean (LSM) duration of each sleep stage (minutes) was compared across treatment groups from pooled data on Nights (NT)1/2 and NT29/30 for subjects with mild OSA (apnea hypopnea index ≥ 5 to < 15). Treatment-emergent adverse events (TEAEs) were recorded.

Results: The analysis set comprised 409 subjects (LEM5=114/LEM10=105/ZOL=112/PBO=78) with mild OSA. Mean (SD) change from baseline (CFB) in total sleep time was significantly larger (more sleep) in both LEM groups than ZOL or PBO at the post-randomization assessments. CFB for REM sleep was also significantly larger ($P<0.0001$) for both LEM vs ZOL/PBO at both assessments, NT1/2: LEM5 21.08 (21.79), LEM10 32.57 (24.34), ZOL 3.06 (23.51), PBO 2.42 (17.51); NT29/30: LEM5 14.49 (18.12), LEM10 24.26 (24.50), ZOL 0.75 (22.32), PBO 2.14 (22.62). Compared with PBO, CFB for total nonREM sleep significantly increased ($P<0.0001$) in the LEM groups at both assessments, NT1/2: LEM5 39.64 (34.30), LEM10 44.63 (37.85), ZOL 45.80 (37.43); PBO 7.80 (37.88); NT29/30: LEM5 44.66 (37.77), LEM10 44.08 (39.68), ZOL 36.22 (41.95), PBO 15.33 (36.52). Compared to ZOL, total nonREM sleep in either LEM group was not significantly different on NT1/2, and only LEM5 was significantly

different vs ZOL at NT29/30 ($P<0.05$). LEM was well-tolerated; most TEAEs were mild/moderate.

Conclusion: LEM significantly increased total sleep time in subjects with insomnia and mild OSA. The additional sleep was comprised importantly with REM sleep, a sleep stage that may be decreased in patients with OSA. These data support the use of LEM in a population with COMISA.

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0355

INSOMNIA IDENTITY'S ASSOCIATION WITH INSOMNIA PROBLEM CHRONICITY AND TREATMENT HISTORY

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Introduction: Insomnia identity is defined as the "conviction that one has insomnia" or self-identifies as an "insomniac." The present study sought to evaluate whether insomnia chronicity and past insomnia treatment predicts whether someone identifies as an "insomniac" in a large sample of adult participants with sleep complaints.

Methods: This study utilized a cross-sectional group design in an archival/community dataset that was collected in the Philadelphia area. The data were drawn from 2,950 adults between 18 and 90 years of age who specifically reported problems with total sleep time (TST). All participants answered questions regarding age of problem onset, insomnia treatment history, and insomnia identity ("Do you think of yourself as an 'insomniac'?").

Results: Of the 2,863 participants included in this analysis (Mean=53.5 $\pm$ 10.7; 76.6% female; 91.2% White), 45.1% identified as an "insomniac." Binary logistic regression was used to examine whether TST problem chronicity (Myyears=12.3 $\pm$ 10.0) and treatment history (36.6%) were associated with the likelihood of identifying as an "insomniac." Outliers were removed and assumptions were met. The model was statistically significant $X^2=(2, N=2,863)=172.4$, $p<0.001$, suggesting that it could distinguish between those who did and did not identify as an "insomniac." The model correctly classified 60.9% of cases. TST problem chronicity (OR=1.04, 95% CI [1.027, 1.043]) and treatment history (OR=0.51, 95% CI [0.435, 0.596]) significantly contributed to the model.

Conclusion: Participants were 4% more likely to identify as an "insomniac" with each year of TST problem chronicity and were 49% less likely to identify as an "insomniac" if they engaged in prior insomnia treatment. Findings align with a recent study that also found that individuals with insomnia identity reported longer insomnia chronicity and that individuals with and without insomnia identity seek insomnia treatment. Future analyses should consider additional variables including insomnia frequency (days per week), severity (e.g., total nocturnal wakefulness [TWT]), daytime symptomatology, perceived sleep need, and demographic factors including age, sex, and race.

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0356**IS THERE AN ASSOCIATION BETWEEN INSOMNIA AND TEMPERAMENT IN ADULTS?**Bethany Lundy¹, Carissa Noall¹, Daniel Kay¹¹ Brigham Young University

Introduction: Insomnia is an increasingly prevalent health concern influenced by environmental, biological, and dispositional factors. Adult temperament is the collection of fundamental characteristics that some have hypothesized may predispose individuals to insomnia. Despite this, there is little research on the relationship between insomnia and specific temperament factors in adults. A few investigations have shown negative affect as the most consistent association with poor sleep. This study investigated relationships between insomnia and adult temperament and tested whether the association between negative affect and insomnia is better explained by depression.

Methods: Participants were 66 adults, (Mdn = 23, 18-49 years old), 50% female, 86% white, ranging from good (no insomnia) to poor sleepers (mild to moderate insomnia). Data were pooled from two protocols designed to investigate associations between sleep and transdiagnostic features of mental illness. As part of a broader array of questionnaires and assessments, participants completed the insomnia severity index (ISI), adult temperament questionnaire (ATQ), and the patient health questionnaire-9 (PHQ-9). The ATQ subscales were calculated according to previously identified factors: negative affect, effortful control, orienting sensitivity, and extraversion/surgency. Spearman's coefficient was used to explore associations between each temperament factor and insomnia severity. Multiple regression was used to determine whether the associations between insomnia severity and negative affect remained when adjusting for PHQ-9 total score, not including the sleep items.

Results: Insomnia severity was significantly correlated with negative affect ($\rho = 0.345$, $p = .005$), but no other temperament factors ($p > .05$, for all). Regression analysis of all four ATQ factors and the PHQ-9 in predicting ISI outcomes resulted in an R^2 of .45, PHQ-9 being the only significant regressor ($p < .05$).

Conclusion: We failed to find support for the hypothesis that individual differences in temperament confer risk for insomnia. Although insomnia was associated with negative affect in bivariate correlation analysis, this association may be better explained by their shared association with depression. We recommend investigating how temperament interacts with various psychological conditions such as depression and anxiety to better understand the individual differences that may impact risks for developing insomnia.

Support (if any): n/a

Abstract citation ID: zsad077.0357

0357**PIMAVANSERIN 34MG AT BEDTIME FOR INSOMNIA IN VETERANS WITH POST-TRAUMATIC STRESS DISORDER: OPEN-LABEL CASE SERIES**Melissa Jones¹, Ritwick Agrawal¹, Amir Sharafkhaneh¹, Mohamed Elammari¹, Zhifang Zhao², Ricardo Jorge¹, Laura Marsh¹¹ Baylor College of Medicine, ² Michael E. DeBakey VA Medical Center

Introduction: There is a critical need for effective and feasible interventions to address insomnia associated with post-traumatic stress disorder (PTSD). Several lines of evidence suggest that pimavanserin, a 5-HT_{2A} inverse agonist approved by the FDA for the treatment of Parkinson's disease psychosis, may benefit PTSD-related sleep disturbances. We conducted a pilot, open-label study of pimavanserin 34mg at bedtime for the treatment of PTSD-associated insomnia to preliminarily assess the feasibility of this intervention and tolerability of our protocol (NCT04188392).

Methods: Adult, male and female Veterans with chronic insomnia disorder and PTSD received fixed dose, open label pimavanserin 34mg at bedtime for 6 weeks. Subjects completed 7 days of actigraphy monitoring and two consecutive in-lab polysomnograms (PSGs) pre-treatment. Safety and adherence were assessed in-person at weeks 3 and 6 and otherwise weekly via telephone. Actigraphy monitoring and a closeout PSG were repeated at week 6. Primary outcomes were recruitment and retention rates, defined as the total number of subjects recruited into treatment (goal n=6) and treatment completion rates (goal 75%), respectively.

Results: A total of 6 subjects (mean age 35.3 [S.D. 6.3] years, 2 [33.3%] female, 2 [33.3%] black or African American, 2 [33.3%] Hispanic, 4 [66.7%] comorbid depression) were recruited over 5.8 months. One subject was found to have mild OSA (AHI 5.6). Insomnia Severity Index (ISI) scores were in the severe range for 4 of 6 [66.7%] subjects. All subjects (100%) completed treatment. There were no serious adverse events or medication discontinuations due to adverse events. Preliminary analyses revealed a greater trend toward improvement on subjective measures of insomnia compared to objective sleep measures.

Conclusion: This open-label case series provides preliminary evidence for the tolerability of pimavanserin in Veterans with PTSD-associated insomnia and feasibility of our protocol. A larger, randomized controlled trial is needed to detect a meaningful clinical difference in insomnia severity following treatment with pimavanserin.

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0358**PREVALENCE OF INSOMNIA SYMPTOMS AND INSOMNIA DISORDER WITHIN VA SUBACUTE REHABILITATION**Angelica Boeve¹, Julia Boyle², Jennifer Moye², Jane Driver¹, Marcus Ruopp¹, Kelly O'Malley¹¹ VA Boston Healthcare System, ² New England Geriatric Research Education and Clinical Center

Introduction: Approximately 40% of Veterans report insomnia symptoms and 12% of Veterans have a formal insomnia disorder diagnosis. While these numbers reflect outpatient prevalence rates, there is little data on the prevalence of insomnia symptoms and insomnia disorder among the 32,000 Veterans receiving care within VA Community Living Centers (CLC) (rehabilitation and long-term care facilities) each year. The present analysis provides an initial step in understanding the prevalence of insomnia disorder vs. insomnia symptoms

within a local VA CLC subacute rehabilitation unit. This analysis is part of a clinical innovation project that evaluated Veterans' sleep during admission for the purposes of informing clinical interventions.

Methods: 67 Veterans were admitted to a VA subacute rehabilitation unit following hospital discharge between March and August 2022. Veterans were asked to complete a brief evaluation within 7 days of admission, including the Insomnia Severity Index (ISI), Sleep Need Questionnaire (SNQ), and Epworth Sleepiness Scale (ESS). Sleep disorder diagnoses were obtained through chart reviews. Descriptive statistics were used to evaluate the prevalence of sleep disorders, insomnia severity, sleep need, and daytime sleepiness.

Results: 48 of 67 (71.6%) Veterans (Mage=72.8±12.0;97.9%male;79.2%white) completed evaluations within 7 days of admission. 52.1% of Veterans reported at least sub-threshold insomnia (ISI≥8) with 22.9% reporting moderately severe clinical insomnia (ISI≥15). 50% reported not meeting their sleep need (SNQ≥13) and 33.3% reported at least mild levels of daytime sleepiness (ESS≥11). Chart reviews indicated only 25% of Veterans had a formal sleep disorder diagnosis in their chart and only 4.2% Veterans had a formal diagnosis of insomnia disorder.

Conclusion: The results of this preliminary analysis highlighted the discrepancy between national outpatient statistics and local inpatient statistics on the prevalence of insomnia symptoms and disorder. While the Veterans admitted to the CLC may be experiencing additional factors influencing their sleep (e.g., environmental disruptors), this does not wholly explain the discrepancy between the local and national samples. Future evaluations should include multiple VA sites to obtain a more representative sample of Veterans. Clinically, these findings suggest that insomnia disorder should be considered a standalone diagnosis and added to Veterans' charts when clinically elevated symptomatology is endorsed.

Support (if any):

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0359

RELATIONSHIPS BETWEEN SLEEP VALUATION AND SLEEP PATTERNS

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Introduction: Sleep valuation is the relative worth placed on sleep. Individual differences in sleep valuation relate to age, gender, depression, and overall sleep health. The factor structure of sleep valuation and how subfactors of sleep valuation relate to sleep health outcomes remain unclear. This study investigated how latent factors of sleep valuation relate to sleep health.

Methods: Data were collected from 125 adults, primarily college students (59% female, mean age 21, and 87% white), who completed the 43-item Sleep Valuation Item Bank, the Insomnia Severity Index, and a standard sleep diary. Based on observations from a previous study, sleep valuation items were separated from sleep devaluation items and principal axis factoring analyses were run for each set of items. Spearman's

correlation analyses were used to explore associations between sleep valuation and devaluation subfactors with demographics, general and mental health, insomnia severity, in bed time, total sleep time, and sleep efficiency reported on the sleep diary for the prior night.

Results: Based on the scree plot method, three sleep valuation (sleep wanting, preference/prioritizing, and enjoyment) and two devaluation (sleep aversion and procrastination) subfactors emerged in the factor analysis. Greater sleep wanting was associated with female gender, poorer general and mental health, more severe insomnia, and later bedtime, $p<.05$, for all. Sleep preference/prioritizing was associated with female gender and poorer mental health, $p<.05$, for all. Sleep enjoyment was associated with lower insomnia severity and greater sleep efficiency, $p<.05$, for all. Sleep aversion was not associated with any sleep diary variable. Sleep procrastination was associated with a later bedtime, less time in bed, and greater insomnia severity, $p<.05$, for all.

Conclusion: Findings closely replicated prior studies including a similar factor structure and the association of sleep valuation to gender, mental and physical health, and insomnia severity. Sleep valuation and devaluation patterns were intimately related to self-reported sleep behaviors. The direction of these associations could not be determined. Nevertheless, we recommend development and testing of primary and tertiary interventions that target sleep valuation patterns to explore their impact on sleep health behaviors.

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0360

SHIFTS IN DAYTIME FUNCTIONING ITEMS ON THE INSOMNIA SEVERITY SCALE WITH LEMBOREXANT AFTER 6 MONTHS OF TREATMENT

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Introduction: The Insomnia Severity Index (ISI) is a 7-item self-reported questionnaire evaluating perception of symptom severity included in Phase 3 studies of lemborexant (LEM), a competitive dual orexin receptor antagonist approved in several countries to treat adults with insomnia. The ISI total score, and items 4-7 for daytime function (DF), improved significantly with LEM treatment compared to placebo (PBO) as assessed at 1, 3 and 6 months. Here we report shifts in DF scores at 6 months depending on baseline severity.

Methods: Study 303 was a 12-month, randomized, double-blind PBO-controlled (first 6months; Treatment Period 1 [TP1]) phase 3 study in subjects (age ≥18y) with insomnia disorder. Subjects were randomized to PBO, LEM 5mg (LEM5) or 10mg (LEM10) for 6 months. ISI items are rated on a 5-point Likert scale from 0 (no problem) to 4 (very severe problem). Daytime-related items include ratings on sleep satisfaction, extent symptoms are noticeable to others, cause worry/distress, or interferes with daily function. Data were analyzed by Cochran-Mantel-Haenszel test of general association vs placebo.

Results: Of the 949 subjects, 749 (78.9%) completed the ISI at baseline and end of TP1: PBO (258/318 [81.1%]; LEM5, 257/316 [81.3%]; LEM10, 234/315 [74.3%]). Baseline daytime ISI-total-score distribution was similar between groups; most had scores of 9-12 (66.7-68.6%). At the end of TP1, more subjects with baseline scores of 9-12 shifted to 0-4 with LEM5 (49.7%) and LEM10 (46.2%) than with PBO (26.6%). Similarly, more subjects with baseline scores of 13-16 shifted to 0-4 with LEM5 (39.1%) and LEM10 (46.3%) than with PBO (29.6%). An additional 28.1% and 25.9% of subjects with LEM5 or LEM10, respectively, with baseline scores of 13-16 shifted to scores of 9-12, compared with 31.5% of PBO. The overall shift distributions were significantly different, favoring both LEM groups ($p < 0.01$).

Conclusion: More LEM-treated subjects improved in daytime functioning as evidenced by the significantly large number of subjects whose scores moved into the lower categories (i.e., better sleep) compared with PBO subjects. These data support important improvements in daytime function that are evident even after 6 months of continuous LEM treatment.

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0361

SLEEP DISTURBANCES IN A SAMPLE OF PREGNANT MILITARY MOTHERS

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Introduction: Pregnant civilians report poor sleep quality, insufficient nighttime sleep, sleep fragmentations, and significant daytime sleepiness. Sleep disturbances are associated with increased risk of adverse outcomes during pregnancy (e.g., pre-eclampsia) and labor and delivery outcomes (e.g., cesarean section). The military population is at increased risk of developing sleep disorders. The military population is at increased risk of developing sleep disorders. We aimed to identify the prevalence of insomnia symptoms in a sample of active duty and military dependent pregnant women.

Methods: Pregnant individuals (N=100) were recruited from large Military Treatment Facility in Texas. Participants were predominantly between ages 25-29 (32%), White (67%), Non-Hispanic (75%), in their second trimester (56%), Active Duty Air Force (48%), Enlisted (44%), and married (87%). In this cross-sectional study, participants completed a survey containing the Insomnia Severity Index (ISI), Pre/Peri pregnancy sleep, and obstetric care questions. Ordinal logistic regression was performed using SAS to determine if pregnancy trimester predicted outcomes including: insomnia, poor sleep quality, and perceived sleep-related impairment.

Results: Twenty percent presented with moderate/severe insomnia per ISI. The odds of having Insomnia (Severe vs No/absence) are 8.09x higher in the third trimester than first trimester

($p=0.002$). The odds of having poor sleep quality during pregnancy are 33.17x higher in the third trimester compared to first trimester ($p<.0001$). Mothers in the third trimester were 1.02x more likely to perceive other mothers as having significant sleep problems than those in the first trimester ($p=0.02$). Despite these reported sleep difficulties, 98% were not referred for a sleep consultation visit.

Conclusion: Findings suggested 20% of pregnant individuals associated with the U.S. Military experienced significant sleep concerns with no active plan for treatment. Individuals in their third trimester were more likely to have high ISI scores, report poorer sleep quality, and more likely to suspect significant sleep problems as common throughout pregnancy. Pregnancy is a critical period for intervention as chronic insomnia diminishes military readiness and compromises health. Insomnia prevention and intervention is greatly needed and could be integrated into obstetric clinics early in pregnancy.

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0362

SLEEP MEDICATION USE IN HOSPITALIZED GERIATRIC PATIENTS AND ASSOCIATED OUTCOMES

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Introduction: Disturbances in the diurnal sleep-wake cycles are prevalent within the geriatric population, consequently increasing the development of insomnia. Although insomnia is commonly treated in the inpatient setting, many pharmacologic interventions are classified as potentially inappropriate medications for the geriatric population, as defined through the Beers Criteria; potentially increasing the risk for adverse events (AEs) in this population.

Methods: A retrospective review and comparative analysis of medications used for the treatment of insomnia (diphenhydramine [DPH], hydroxyzine [HDX], trazodone [TZD]) in 121 hospitalized geriatric patients (≥ 65 years old) in our facility during the month of October 2021 was conducted. Multiple regression analysis was used to identify associations between selected medication use and AEs including inpatient falls, new or worsening delirium, and new onset urinary retention. Comparative analysis using individual T-testing between groups, and Kruskal-Wallis Testing for total comparison was used to identify significance between group outcomes.

Results: Patients treated with DPH or HDX showed significantly higher rates of AEs compared to patients treated with TZD ($p < 0.001$); but showed no significant difference in frequency of AEs between themselves ($p=0.816$). 54.8% of patients treated with DPH and 57.7% of patients treated with HDX had at least one recorded AE during their hospital stay. The most common AE in all treatment groups was new or worsening delirium at 31.0%, 38.5%, and 15.6% in DPH, HDX, and TZD groups respectively. Both DPH and HDX groups showed AEs of falls (4.8% and 11.5%) and new onset urinary retention

(14.3% and 7.7%) respectively, whereas the TZD group showed neither of these AEs. Analysis yielded secondary outcomes with AE of new onset constipation occurring only within the DPH group at 11.9%. Further, secondary analysis showed treatment with DPH had a significant increase in hospital length of stay (HLOS) compared to TZD use ($p < 0.01$), but not compared to HDX use ($p = 0.755$).

Conclusion: Treatment of insomnia in hospitalized geriatric patients is complex. Use of anticholinergic medications (DPH/HDX) substantially increases the risk for AEs within this population. Further, the use of DPH showed significant increased HLOS, possibly as a direct result of AEs incurred with the use of these medications.

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0363

SOUND VS. SIGHT: A MODALITY-SPECIFIC PRELIMINARY INVESTIGATION OF SLEEP-RELATED ATTENTIONAL BIAS IN OLDER ADULTS

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Introduction: Increased attention to sleep-related stimuli (i.e., “sleep-related attentional bias”) may contribute to the persistence of insomnia symptoms. Despite high prevalence of insomnia disorder in older adults, studies investigating this phenomenon in this population are lacking. Additionally, it is unclear whether this bias occurs only for visual stimuli or more broadly, such as for auditory stimuli. This study examined whether auditory and visual sleep-related attentional bias differed as a function of insomnia disorder in older adults.

Methods: Sixty-one older adults ($\text{Mage} = 68.2 \pm 5.9$; 41 women/) with ($n = 22$) and without ($n = 39$) insomnia (met DSM-5 criteria plus reported 6+ nights/14 of >30 mins sleep onset latency or wake after sleep onset on daily diaries) completed modified Posner Cueing and Dot Probe tasks. Task cues included sleep-related auditory (e.g., alarm clocks, snoring), visual (e.g., clocks set to bedtimes, person awake in bed) and non-sleep (auditory: pure tones; visual: neutral images from the International Affective Picture system) stimuli. For Posner, valid [non-cued reaction time (RT) minus validly-cued RT] and invalid (non-cued RT minus invalidly-cued RT) sleep and non-sleep related visual and auditory cueing effects were calculated. For Dot Probe, valid (non-sleep/neutral cued RT minus sleep-related validly-cued RT) and invalid (non-sleep/neutral cued RT minus sleep-related invalidly-cued RT) visual cueing effects were computed. Independent t-tests examined whether auditory/visual mean cueing effects for sleep and non-sleep stimuli differed by insomnia status.

Results: Posner valid auditory sleep-related cueing effects were larger ($p = .04$) for those with insomnia ($104.6 \pm 47.6\text{ms}$) vs. without ($80.7 \pm 57.3\text{ms}$). Valid auditory non-sleep related cueing effects were also larger ($p = .001$) for insomnia ($118.9 \pm 48.8\text{ms}$) vs. without ($67.9 \pm 77.2\text{ms}$). For Dot Probe, there was a trending difference ($p = .07$) between visual sleep-related valid cueing effects for insomnia ($14.7\text{ms} \pm 6.7\text{ms}$) vs. without ($-1.8\text{ms} \pm 7.1\text{ms}$).

Conclusion: Preliminary findings suggest older adults with insomnia experience larger visual sleep-related attentional bias

than those without insomnia. Further, greater auditory attentional bias in insomnia may reflect general auditory cortex hypervigilance. Aging adults with insomnia may benefit from stimulus desensitization towards insomnia triggers across sensory modalities to potentially facilitate sleep.

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0364

THE EFFECT OF LEMBOREXANT ON POLYSOMNOGRAPHIC SLEEP PARAMETERS IN ADULTS WITH MILD, MODERATE, OR SEVERE OBSTRUCTIVE SLEEP APNEA

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Introduction: Several commonly prescribed hypnotics may worsen respiratory function, especially in the elderly. Lemborexant (LEM) is a dual-orexin-receptor-antagonist approved to treat adults with insomnia. In Studies 102 (NCT03471871) and 113 (NCT04647383), LEM demonstrated respiratory safety in subjects with mild, moderate, or severe obstructive sleep apnea (OSA) who did not report insomnia. The current analyses evaluated sleep variables from these studies.

Methods: Studies 102 and 113 were double-blind, placebo (PBO)-controlled, crossover studies in adults with untreated mild (apnea-hypopnea-index [AHI] ≥ 5 to < 15), moderate (AHI ≥ 15 to < 30), or severe (AHI ≥ 30) OSA, without insomnia. Subjects were randomized to two 8-night periods (separated by ≥ 14 days) treated with LEM 10mg (LEM10) or PBO. Latency to persistent sleep (LPS), sleep efficiency (SE), and wake after sleep onset (WASO) were assessed using polysomnography on Days 1 (D1) and 8 (D8).

Results: The analysis set comprised 39, 13, and 20 subjects with mild, moderate, or severe OSA, respectively. On both days, LPS was not statistically different from PBO in any group. Compared with PBO, SE was significantly greater on D1 in subjects with mild (LEM10, 90.43; PBO, 80.31; $P < 0.0001$), moderate (LEM10, 88.83; PBO, 84.02; $P = 0.016$), and severe (LEM10, 87.76; PBO, 77.84; $P < 0.0001$) OSA. On D8, SE was significantly greater in subjects with mild (LEM10, 86.65; PBO, 80.59; $P = 0.003$) and moderate (LEM10, 88.45; PBO, 80.70; $P = 0.004$) OSA, with a trend towards significance in subjects with severe (LEM10, 85.60; PBO, 80.63; $P = 0.055$) OSA. WASO was significantly lower (improved) on D1 in subjects with mild (LEM10, 33.30; PBO, 76.76; $P < 0.0001$), moderate (LEM10, 44.26; PBO, 64.71; $P = 0.008$), and severe (LEM10, 42.03; PBO, 91.49; $P < 0.0001$) OSA. On D8, WASO was significantly lower in subjects with mild (LEM10, 51.74; PBO, 70.52; $P = 0.015$) and moderate (LEM10, 49.16; PBO, 75.15; $P = 0.008$) but not severe (LEM10, 59.85; PBO, 74.46; $P = 0.161$) OSA. LEM was well-tolerated.

Conclusion: In untreated OSA subjects without insomnia, irrespective of OSA severity, LEM improved sleep maintenance versus PBO. LPS did not differ between treatments since such patients may not report sleep onset difficulties. These findings support the use of LEM for patients with comorbid insomnia and sleep apnea (COMISA).

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0365

THE EFFECTIVENESS OF DIGITAL COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA, FATIGUE, AND QUALITY OF LIFE IN CANCER PATIENTS

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Introduction: The emotional, psychological and financial challenges of a cancer diagnosis profoundly affect patients and contribute to sleep difficulties. Insomnia affects 31%-54% of those newly diagnosed or undergoing treatment, and persists up to 5 years after treatment for cancer. Cognitive behavioral therapy (CBT) for insomnia is effective for sleep and insomnia outcomes, with no difference in outcomes for in-person or self-help CBT. Trials of digital CBT (dCBT) have recruited breast cancer survivors from Denmark and past pilot work did not identify statistically significant effects for fatigue and quality of life in US cancer survivors with insomnia. This study examined the effectiveness of a fully automated digital therapeutic (Sleepio) for improving insomnia, fatigue, and quality of life in patients with cancer from the US, UK, and Australia.

Methods: This is a secondary analysis of participants (n=70) with insomnia who self-reported a cancer diagnosis before randomization in a large effectiveness trial of dCBT for insomnia. Participants were randomized to receive either dCBT or a sleep hygiene education control. Insomnia (SCI-8), fatigue (FFS), and global health-related quality of life (PROMIS-10) were evaluated at baseline, 8-weeks post treatment and 24-weeks follow-up. Effect estimates are mean group differences, adjusted for baseline scores estimated using regression models.

Results: Digital CBT was superior to control for reducing symptoms of insomnia and fatigue at both post-treatment and follow-up (all $p < 0.05$). For the dCBT group, global PROMIS-10 scores were improved, although not significantly, at post-treatment ($p=0.076$), but were significantly higher at follow-up ($p < 0.05$).

Conclusion: Digital CBT was effective for reducing symptoms of insomnia and fatigue in patients with cancer and results were maintained after five and a half months. Significant improvements in global health-related quality of life scores at follow-up suggest effects extend beyond improvements to sleep. Findings may benefit patients with cancer as dCBT may provide scalable access to an effective treatment without contraindications. Further research is needed to understand the mechanisms and value of improving sleep in those with cancer and sleep difficulty.

Support (if any): Big Health Inc.

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0366

UNDERSTANDING THE MEDIATING ROLE OF SLEEP IMPROVEMENT ON ANXIETY SYMPTOMS USING DIGITAL CBT FOR INSOMNIA

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Introduction: Insomnia has significant overlap with anxiety, and CBT for insomnia, in addition to improving sleep, leads to concomitant reductions in anxiety. Nevertheless, few studies have evaluated the anxiolytic effects of CBT for insomnia in individuals with insomnia and clinically significant anxiety symptoms or an anxiety disorder diagnosis. Large studies of digital CBT provide a prudent source to evaluate the transdiagnostic role of insomnia to reduce anxiety symptoms. Using data from two trials of dCBT for insomnia, we evaluated whether sleep is a transdiagnostic treatment target to reduce anxiety symptoms in individuals with insomnia and clinically significant anxiety.

Methods: Individual data from 2,172 participants with insomnia and clinically significant anxiety symptoms were extracted from two previously conducted randomised controlled trials of dCBT for insomnia. Participants received either dCBT or control (usual care or sleep hygiene education). Assessments were conducted at baseline, post-intervention (week 8 or 10), and follow-up (week 22 or 24). Insomnia symptoms were assessed using the Sleep Condition Indicator (SCI-8), and anxiety symptoms using the 7-item Generalized Anxiety Disorder scale (GAD-7). Mediation was evaluated using structural equation models.

Results: Compared with control, dCBT for insomnia was superior at reducing symptoms of insomnia (Hedges' g range: 0.71-0.88; both $p < 0.001$) and anxiety (Hedges' g range: 0.39-0.44; both $p < 0.001$). At post-intervention, participants in the dCBT group were significantly more likely to achieve remission (OR = 2.24 (0.30); < 0.001 (1.72, 2.91)) and reliable remission (OR = 2.24 (0.30); < 0.001 (1.73, 2.89)) of their anxiety. Improvements in sleep at post-intervention mediated 84% of the effect of dCBT on anxiety symptoms at follow-up.

Conclusion: Targeting insomnia symptoms via digital CBT for insomnia may be an appropriate means by which to reduce anxiety symptoms in individuals with insomnia and comorbid anxiety. These findings reinforce the transdiagnostic benefits of CBT for insomnia and digital CBT may offer an accessible first step intervention.

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0367

URBAN STRESS AND SLEEP HEALTH BY PROXIMAL NEIGHBORHOOD GROUPS IN WASHINGTON, DC

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Introduction: African Americans are disproportionately affected by environmental factors that increase the risk for negative health outcomes. Analyses from National Health Interview Survey (NHIS) data estimated 15 to 75 percent of the disparities between Black and White respondents being accounted for by residential context. Poor sleep health, particularly short sleep duration, has been linked to metabolic and cardiovascular disease. A population study indicated that sleep duration of less than 6 hours was more common among African Americans compared with other racial groups in the United States and this association was accounted for by African Americans living in high density urban environments. Threats of violence may engender feelings of vulnerability when sleeping and be an important determinant of sleep health though this relationship has not been adequately studied. The aim of this study is to determine how an individual's sleep health relates to violent crime rates in their neighborhood of residence as well as indicators of neighborhood stress endorsed in a self-reported survey.

Methods: African- American men and women between the ages of 18-35 filled out the insomnia severity index (ISI) and city stress inventory (CSI). Sleep duration and sleep efficiency were obtained through home-based actigraphy. Participants were categorized as poor sleepers if two out of three criteria were met: sleep duration of less than six hours, ISI greater than 10, and sleep efficiency below 85%. Participants addresses were linked to one of the 51 proximal neighborhood groups (PNG) defined by the DC Department of Health and Office of Planning using MAR geocoder and QGIS mapping software. Violent death rates and other social health determinants are indicated by PNG in the DC DOH's Health Equity Report (2019).

Results: Sleep measures were not correlated with neighborhood violent death rates (Pearson r 's: .05 - .17; all NS). SE and TST were weakly correlated with CSI scores (both r 's = -.22, NS).

Conclusion: The negative findings may be related to sample size, the presence of threat and crime in all of the locations, and the importance of individual coping.

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0368

VULNERABILITY TO INFLUENZA-LIKE ILLNESS IS ASSOCIATED WITH INSOMNIA SEVERITY

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Introduction: Decreased immune function is associated with sleep disorders, including insomnia. Our goal was to evaluate the vulnerability to influenza-like illness (ILI) in insomnia as

quantified by the insomnia severity index (ISI). To evaluate ILI vulnerability, we leveraged a published model that estimates the daily probability of ILI symptoms from a smart bed using ballistocardiograph sensors.

Methods: A longitudinal IRB-approved study was conducted with Sleep Number customers between November 2021 and April 2022 to assess the longitudinal course of insomnia. Four surveys incorporating the ISI were administered at six-week intervals. Individuals responding to at least three surveys were included in the analysis ($n=3117$). ISI changes were modeled using linear regression to identify respondents with quasi-constant ISI for which ILI vulnerability was quantified. For each respondent, the mean ISI (μI) was calculated and categorized into two levels: no insomnia ($\mu I \leq 14$) and insomnia ($\mu I > 14$). Bed data, including daily and restful sleep duration, sleep latency, sleep quality, heart rate, breathing rate, and motion level, were queried for 2019 (pre-COVID) and 2021 to evaluate the daily probability of experiencing ILI symptoms.

Results: Respondents with quasi-constant ISI ($n=1680$) included no-insomnia (1431) and insomnia (249). For 2019, the no-insomnia group had 1.23 (SD 1.82) ILI episodes on average which was significantly lower ($p < 0.01$) than the insomnia group, 1.49 (SD 1.77). The ILI-risk odds ratio for insomnia was 1.15 (CI 0.99-1.32). The mean ILI episode duration for the no-insomnia group was 4.29 (SD 7.19) days, which was significantly lower ($p < 0.01$) than the insomnia group 6.06 (SD 8.90) days. For 2021, similar results were obtained, with the no-insomnia group having significantly ($p < 0.01$) lower ILI episodes 1.22 (SD 1.63) on average compared to the insomnia group 1.49 (SD 1.67). The mean ILI episode duration for the no-insomnia group, 4.98 (SD 8.22) days, was significantly lower ($p < 0.01$) than the insomnia group, 6.14 (SD 7.93) days.

Conclusion: Insomnia may be significantly associated with more and lengthier ILI episodes per year. This was found for both 2019 and 2021 data. Additional research is needed to evaluate causality.

Support (if any): Sleep Number Corporation funded this study.

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0369

ZERO-TIME EXERCISE ON PHYSICALLY INACTIVE ADULTS WITH INSOMNIA DISORDER: A RANDOMIZED CONTROLLED TRIAL

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Introduction: Exercise is a potential treatment for insomnia. However, lack of time is a major barrier to starting and maintaining exercise. Therefore, a brief exercise training program, called Zero-time Exercise (ZTE), was developed to relieve insomnia. ZTE is a simple exercise that can be incorporated into habitual daily routines, requiring no extra time or equipment. This study examined the effectiveness of a ZTE intervention program on sleep and related outcomes in inactive adults with insomnia disorder.

Methods: This randomized controlled trial (RCT) included 140 physically inactive adults (mean age: 46.7 years, SD: 14.0; 82.1% female) with insomnia disorder from the community. They were randomly assigned to ZTE training or sleep hygiene education (SHE) group. Subjects received two 2-hour ZTE training or SHE lessons according to their

group allocation. They were told to practice ZTE_x or follow sleep hygiene instructions for 24 weeks. The primary outcome measure was the Insomnia Severity Index (ISI) at weeks 8, 16, and 24. The secondary outcomes included sleep parameters by subjective sleep diaries and objective actigraphy; objective physical activity levels assessed by waist-worn accelerometers; and anxiety, depression, and fatigue levels evaluated by questionnaires.

Results: Compared with the SHE group, a significantly greater reduction of ISI was observed in the ZTE_x group at week 24 ($d = 0.60$, $P = 0.005$). No significant between-group difference was observed in sleep parameters measured by sleep diary or actigraph at all study visits, except that sleep-diary-derived wake time after sleep onset was significantly lower in the ZTE_x group at week 8 ($d = 0.24$, $P = 0.035$). The ZTE_x group showed a significant improvement in the Multidimensional Fatigue Inventory (MFI) reduced-activity subscore ($d = 0.27$, $P = 0.036$) and reduced-motivation subscore ($d = 0.33$, $P = 0.013$) at week 8, but also a higher MFI physical fatigue ($d = -0.58$, $P = 0.008$).

Conclusion: The ZTE_x training program improves physically inactive individuals' insomnia severity and daytime impairment.

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0370

A THREE-ARM RANDOMIZED CONTROLLED TRIAL EXAMINING MINDFULNESS-BASED AND COGNITIVE-BEHAVIORAL THERAPIES FOR PRENATAL INSOMNIA

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Introduction: Cognitive behavioral therapy for insomnia (CBTI) improves sleep in pregnancy, but its therapeutic benefits may be diminished in pregnancy due to undertreatment of cognitive arousal (i.e., heightened cognitive activity, especially at night). A recent proof-of-concept, single-arm trial suggested that combining behavioral sleep strategies with mindfulness components produced large reductions in prenatal insomnia, depression, and cognitive arousal. The present study was a randomized controlled trial evaluating the effectiveness of this mindfulness-based intervention and CBTI relative to a control condition.

Methods: Sixty-four pregnant women with clinically significant insomnia symptoms were randomized to a mindfulness-based intervention, CBTI, or control. The mindfulness intervention was Perinatal Understanding of Mindful Awareness for Sleep (PUMAS), which places behavioral sleep strategies within a mindfulness framework and tailors all components to pregnancy. PUMAS and CBTI were delivered via six telemedicine sessions, whereas control patients electronically received six weekly information sheets on perinatal sleep health. Treatment outcomes were assessed before and after treatment, which included the insomnia severity index (ISI), Edinburgh postnatal depression scale (EPDS), and pre-sleep arousal scale's cognitive factor (PSASC; nocturnal cognitive arousal). Treatment outcomes were analyzed via general

linear models, and the PRODCLIN method tested mediation models in evaluation of treatment mechanisms.

Results: Intent-to-treat analyses revealed significant ISI reductions in the PUMAS (-11.05 ± 3.84) and CBTI (-11.20 ± 6.87) conditions relative to control (-4.27 ± 1.96). Insomnia remission rates were highest among PUMAS patients (81.8%), whereas 65.0% of CBTI patients and 13.6% of controls remitted. PUMAS significantly alleviated depression relative to control (EPDS: -3.77 ± 3.88 vs -0.59 ± 2.84 , $p = .017$), whereas CBTI did not differ from either group (EPDS: -2.55 ± 4.25 , p -values $\geq .271$). Similarly, PUMAS alleviated cognitive arousal relative to control (PSASC: -8.82 ± 4.99 vs -3.45 ± 4.53 , $p = .009$), whereas CBTI did not differ from either group (PSASC: -7.30 ± 7.49 , p -values $\geq .104$). Mediation analyses estimated that reductions in cognitive arousal mediated 26.6% and 40.6% of PUMAS effects on insomnia and depression.

Conclusion: PUMAS alleviated insomnia, depression, and cognitive arousal relative to control. Reducing cognitive arousal was a significant treatment mechanism by which PUMAS alleviated insomnia and depression. By comparison, CBTI significantly alleviated insomnia relative to control, but yielded no significant effects on depression or cognitive arousal.

Support (if any):

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0371

ACUTE EFFECTS OF CANNABINOIDS IN INSOMNIA DISORDER: A RANDOMISED, PLACEBO-CONTROLLED TRIAL USING HIGH-DENSITY EEG

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Introduction: Medicinal cannabis is often cited as a popular alternative to common sleep aids; however, there are limited studies using complex sleep EEG methods examining its' effects in insomnia disorder.

Methods: Twenty participants (16 female; mean [SD] age, 47.1 [8.7] years) with insomnia disorder (mean ISI=20.8) completed two 24-hour in-laboratory visits during which they received a single oral dose of 'CBD/THC' containing 200 mg cannabidiol (CBD) and 10 mg $\Delta 9$ -tetrahydrocannabinol (THC) or matched placebo. Co-primary outcomes were total sleep time (TST) and wake after sleep onset (WASO). Secondary outcomes included next-day neurobehavioural function and sleep architecture metrics determined using overnight polysomnography with high-density EEG. Trial registration: ACTRN12619000714189.

Results: Compared to placebo, CBD/THC significantly decreased TST (-24.5 min, $p = 0.047$) with no significant change to WASO ($+10.7$ min, $p = 0.422$). CBD/THC significantly decreased time spent in REM sleep (-8.1% , $p < 0.001$) and increased REM sleep latency ($+65.6$ min, $p = 0.008$). High-density EEG analysis revealed a significant reduction in high-frequency EEG activity overlying the posterior and frontal cortex during N2 sleep with CBD/THC treatment compared to placebo. CBD/THC treatment also reduced delta activity in the posterior region of the brain during N3 sleep and increased alpha and beta activity during REM sleep in the posterior regions of the brain relative to placebo (all p 's < 0.05). CBD/THC did not impair next-day (+12 h

post-treatment) cognitive performance, alertness, or simulated driving performance (all p 's > 0.05). Eighty-five mild, non-serious, adverse events were reported (55 during ETC120; most common dry mouth, drowsiness, and fatigue).

Conclusion: An acute dose of combined 200 mg CBD and 10 mg THC reduced TST with a clear effect of REM sleep suppression. However, no next-day residual impairment on cognitive function, alertness or simulated driving performance were observed. Further research is required to determine the impact of chronic cannabinoid dosing on REM sleep and other objective sleep outcomes in insomnia disorder.

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0372

ASSOCIATION BETWEEN THE REAL-WORLD USE OF GABA RECEPTOR AGONISTS AND DAYTIME IMPAIRMENT IN US PATIENTS WITH INSOMNIA

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Introduction: Currently available data inadequately quantify daytime impairment associated with insomnia disorder and the impact of its treatments in the real-world setting. The objective of this real-world study was to retrospectively examine daytime impairment symptoms before and during pharmacological treatment with non-benzodiazepine receptor agonists (non-BzRAs) and benzodiazepines in US patients with insomnia.

Methods: Information from HealthVerity was retrieved for patients with insomnia aged ≥ 18 years prescribed non-BzRAs or benzodiazepines as first-line treatment between October 2015 and March 2020. For each patient with data, insurance claims data were extracted alongside physician notes in free-text form. Patient demographics and prescription information were extracted from the claims. Daytime impairment symptoms were extracted and quantified from physician notes using an ontology designed with three domains (i.e., alert/cognition, mood and sleepiness) and 14 items analogous to the Insomnia Daytime Symptoms and Impact Questionnaire (IDSIQ). This ontology extends IDSIQ terms to 109 terms in total to reflect the language of physicians. The annualized rate of daytime impairment measures the frequency of symptoms occurring from 182 days before treatment start to about three months (mean) during treatment. The rate is normalized by one year as the duration before and during treatment is different. A single symptom of a visit is counted maximally once within a specific domain.

Results: 2361 and 1045 unique patients were prescribed non-BzRAs and benzodiazepines, respectively. Non-BzRAs treatment was associated with a statistically significant 16% overall increase of daytime impairment symptoms during versus before treatment ($p=0.003$). Statistically significant increase of daytime impairment symptoms with non-BzRA treatment was observed in the alert/cognitive (16%, $p=0.019$),

mood (22%, $p=0.002$) domains, but only nominal increase in the sleepiness domain (12%, $p=0.084$). Benzodiazepine treatment was associated with a statistically significant 19% overall increase of daytime impairment symptoms during versus before treatment ($p=0.047$), with a statistically significant increase seen in the mood domain (26%, $p=0.030$) but only nominal increases in the alert/cognitive (7%, $p=0.76$), and sleepiness (21%, $p=0.079$) domains.

Conclusion: This study shows that treatment of insomnia with commonly used drugs (i.e. non-BzRA and benzodiazepines) is associated with an overall increase in daytime impairment symptoms in a real-world setting.

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0373

ASSOCIATION OF U.S. MILITARY BURN PIT SMOKE EXPOSURE WITH INSOMNIA AND SLEEP APNEA SYMPTOMS

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Introduction: Burn pits (BPs) have been widely used by the U.S. military for waste disposal. Due to the obviously toxic nature of the BP emissions, exposure may contribute to diverse adverse health conditions, including sleep apnea. To our knowledge, this is the first study to examine the association between self-estimated amount of BP emission exposure and self-reported sleep complaints.

Methods: We used an online health questionnaire of the VA/DoD Airborne Hazards and Open Burn Pit Registry administered between April 2014 and August 2022 to 320,231 Veterans and active-duty personnel (age 40.1 ± 9.2 years, BMI 28.8 ± 4.5 kg/m², 11% female, 75% white). Outcomes included insomnia, short sleep duration < 6hrs, sleep apnea events, and snoring. The exposure variable was cumulative BP exposure that was calculated by multiplying the response (in hours) to a question about burn pit exposure by number of deployment days, summing across deployments, and categorizing by quartile. We employed separate logistic regression models to determine the association between cumulative BP exposure days and sleep outcomes using no BP exposure as the reference. We adjusted the models by age, BMI, sex, race, ethnicity, military branch and duty status.

Results: We observed higher odds of insomnia as the duration of BP exposure increased in each quartile (Q1-Q4 ORs: 1.8-3.4, $p < .001$). The same trend was observed for shorter sleep duration (Q1-Q4 ORs: 1.6-2.4, $p < .001$), sleep apnea (Q1-Q4 ORs: 1.4-2.4, $p < .0001$) and snoring (Q1-Q4 ORs: 1.3-1.8, $p < .0001$).

Conclusion: Higher levels of BP emission exposure was associated with a greater report of insomnia symptoms, shorter sleep duration, snoring and sleep apnea events. Future research will focus on examining the association of BP emission exposure and objective sleep data extracted from polysomnography reports in the Veteran Affairs electronic medical records.

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0374

DOES ADDING A CHATBOT AND HUMAN SUPPORT ENHANCE TREATMENT ADHERENCE TO AND EFFICACY OF DIGITAL CBTi? A RANDOMIZED CONTROLLED TRIAL

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Introduction: Digital cognitive behavioral therapy for insomnia (dCBTi) has been shown to be efficacious; however, treatment adherence and efficacy are suboptimal compared to CBTi delivered in person. The present study evaluated whether the addition of different types of coaching support (i.e., phone coaching by a therapist trained in CBTi, phone coaching by a research assistant not trained in CBTi, and virtual coaching by a chatbot that simulates human dialogue) would improve treatment adherence to and efficacy of dCBTi. It was hypothesized that the addition of any form of coaching will have beneficial effects, with therapist coaching achieving the best outcomes.

Methods: A single-blind, parallel, randomized controlled trial was conducted. One-hundred-fifty adults with insomnia, indicated by Insomnia Severity Index (ISI) ≥ 10 , were randomly assigned to one of the five conditions: dCBTi with three 20-min therapist phone coaching sessions (C1), dCBTi with three 20-min non-therapist phone coaching sessions (C2), dCBTi with chatbot virtual coaching (C3), dCBTi without any coaching (C4), and the sleep hygiene and sleep diary control (C5). dCBTi is a smartphone application adopting a six-session CBTi with components of sleep hygiene, sleep restriction, stimulus control, relaxation, and cognitive therapy. Participants completed sleep diaries, ISI, dysfunctional beliefs about sleep (DBAS), sleep-related behavior questionnaire (SRBQ), and measures of mood, fatigue, and quality of life at pre-intervention, post-intervention, and 4-week follow-up.

Results: Mixed modeling analysis showed that participants in C1, C2, C3, and C4 had greater improvements in insomnia symptoms, sleep efficiency, DBAS, SRBQ, mood, and fatigue than C5. Participants in C1 had significantly greater treatment adherence and improvement in DBAS and SRBQ than those in C4; those in conditions with any form of coaching had greater treatment adherence than those in C4. However, improvements in insomnia symptoms were not significantly different between conditions with or without coaching.

Conclusion: Adding human support, especially therapist phone coaching, improved treatment adherence to dCBTi but not efficacy. Nonetheless, adding therapist coaching led to greater improvements in the mechanisms of change, i.e., reductions in dysfunctional beliefs and behaviors related to insomnia, which may promote greater maintenance of treatment efficacy at longer follow-up. Clinicaltrials.gov registration#: NCT05136638
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0375

INCREASED ENGAGEMENT WITH A TAILORED SLEEP GUIDE IS ASSOCIATED WITH REDUCED VARIABILITY IN SLEEP EFFICIENCY IN CHRONIC INSOMNIA

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Introduction: Insomnia is highly prevalent, but difficult to diagnose due to night-to-night sleep variability, and difficult to treat in part due to the lack of trained providers. Consumer sleep technology (CST) allows for longitudinal sleep monitoring in a natural environment. One such device, the Sleep Score Max (SleepScore Labs) combines longitudinal non-contact sleep tracking via radio-frequency biomotion sensor technology with an individualized sleep guide function, which provides tailored recommendations to improve sleep based on the user's objectively measured sleep, bedroom environment, and self-reported daily activity. Focusing on sleep efficiency, we examined if level of engagement with the sleep guide is related to sleep improvement in chronic insomnia.

Methods: As part of a larger study, N=30 individuals with chronic insomnia (ages 38.7 ± 14.9 ; 8 male) participated in an 8-week at-home sleep monitoring study. Enrollment criteria included being 18-65y old and meeting ICSD-3 criteria for chronic insomnia with no other clinically relevant condition contributing to sleep disturbance. Participants were instructed to track their sleep with the aforementioned device and engage with the sleep guide daily for 8 consecutive weeks. For observed sleep efficiency, means (characterizing sleep overall) and within-subject standard deviations (characterizing night-to-night variability) were assessed by week, and change scores from week 1 to week 8 were correlated with level of engagement with the sleep guide function (defined as percentage of days interacted with the guide within the 8-week period).

Results: From week 1 to week 8, mean sleep efficiency increased non-significantly ($t[23]=0.83$, $p=0.42$), but night-to-night variability decreased significantly ($t[23]=-2.16$, $p=0.041$). There was no significant relationship between change in mean sleep efficiency and level of engagement with the sleep guide ($r=0.005$, $p=0.980$), but there was a significant relationship between change in night-to-night variability and level of engagement ($r=-0.48$, $p=0.018$), such that night-to-night variability decreased more in those with greater engagement.

Conclusion: Night-to-night sleep variability is a chief complaint of people with chronic insomnia, and reduced night-to-night variability in sleep efficiency may indicate improvement. As such, engagement with an individualized sleep guide incorporated in a CST device may help individuals with chronic insomnia improve their sleep.

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0376**LONG-TERM EFFECTIVENESS OF COGNITIVE-BEHAVIORAL THERAPY FOR INSOMNIA: A PATIENT-REPORTED OUTCOMES POST-TREATMENT STUDY***Kristina Lenker¹, Elizaveta Bourchtein¹, Caitlin Paquet¹, Susan Calhoun¹, Julio Fernandez-Mendoza²*¹ Penn State Hershey Medical Center, ² Penn State College of Medicine

Introduction: Insomnia is the most prevalent sleep disorder, with 10% of adults meeting criteria for a chronic insomnia disorder (CID). Cognitive-behavioral therapy for insomnia (CBT-I) is the first-line recommended treatment given the strong evidence supporting its efficacy in the short-term and mid-term. Less is known about the effectiveness of CBT-I in routine clinical practice on patient-reported outcomes beyond 3y post-treatment.

Methods: Participants included 68 adults (48±15 years old, 63% female, and 11% minority) who received CBT-I for CID at the Behavioral Sleep Medicine (BSM) program of Penn State Health Sleep Research & Treatment Center³ to 7y prior to the present study. Participants completed Insomnia Severity Index (ISI) and Flinders Fatigue Scale (FFS) at baseline and follow up.

Results: After a median of 5y follow-up, 50% of patients didn't meet insomnia case definition (ISI< 11), and 60% had experienced a meaningful improvement in insomnia severity (change in ISI score of -6 points or more). Only 35% of patients continued to experience moderate-to-severe insomnia (ISI>14) at follow-up. These effects were similar in patients who had a history of a medical (n=42) or psychiatric (n=38) disorder at pre-treatment when compared to those without prior medical or psychiatric disorders (p=0.380 and p=0.467 for insomnia caseness, respectively). The percent of patients absent of clinically significant daytime fatigue (FFS< 13) increased from 29% to 50 after the same period of long-term follow-up, and those with moderate-to-severe daytime fatigue (FFS>15) fell from 62% to 38%. Hypnotic use (i.e., prescription or over-the-counter) decreased from 66% at baseline, though this varied by insomnia status at follow-up: while 56% of insomnia cases (n=34) at follow-up reported still taking medications at bedtime, only 17% of remitted cases (n=34) did (p< 0.001).

Conclusion: This long-term evidence is consistent with prior clinical trials, national trends, and further supports that insomnia is a disorder, not a symptom, comorbid with medical and psychiatric conditions that should be treated independently. The effectiveness outcomes show improved sleep, daytime functioning, and discontinuation of sleep medications, a goal of clinical practice guidelines. Importantly, treatment gains remained after the onset of the COVID-19 pandemic.

Support (if any): Penn State Health Department of Psychiatry Trainee Award

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0377**SLEEP HEALTH DISPARITIES AMONG U.S. MILITARY PERSONNEL AND VETERANS REGISTERED ON THE BURN PIT REGISTRY***Sara Nowakowski¹, Javad Razjouyan¹, Manasa Kokonda¹, Israel Christie², Drew Helmer²*¹ Department of Medicine, Baylor College of Medicine, ² Department of Medicine, Baylor College of Medicine, Houston, TX, USA

Introduction: Disparities are underrecognized factors for sleep health. Additionally, there are concerns about sleep health among Veterans with exposure to burn pit smoke. This study aimed to examine the association between sex, race, and ethnicity and self-reported insomnia and sleep apnea symptoms in Veterans and active duty personnel.

Methods: Using items from the online health questionnaire of the VA/DoD Airborne Hazards and Open Burn Pit Registry administered between April 2014 and August 2022 to 320,231 Veterans and active duty personnel (age 40.1±9.2 y, 11% female, 75% white), we examined the association between sociodemographic variables (sex, race, and ethnicity) and self-reported sleep complaints (insomnia, sleep duration, sleep apnea events and snoring) in separate logistic regression models.

Results: Female sex predicted higher odds of insomnia (OR 1.3), where as male sex predicted higher odds of sleep apnea events (OR 2.6) and snoring (OR 2.4), p's<.0001. African American race predicted higher odds of sleep apnea events, snoring, insomnia and shorter sleep duration (ORs 1.5-3.2, p's<.0001). Hispanic ethnicity predicted higher odds of sleep apnea events, snoring, insomnia and shorter sleep duration (ORs 1.2-1.6, p's<.0001).

Conclusion: We observed a higher prevalence of self-reported sleep complaints among Black and Hispanic compared to White Veterans and active duty personnel who completed the burn pit registry. We also found a higher prevalence of insomnia in females compared to males, while snoring and sleep apnea events were more common in males compared to females. Future research will focus on sleep health disparities of objective sleep data extracted from polysomnography reports in the Veteran Affairs electronic medical records in Veterans on the burn pit registry.

Support (if any): This work is supported by the Department of Veteran Affairs, Veterans Health Administration, Office of Research and Development, Center for Innovations in Quality, Effectiveness and Safety (CIN 13-413); Michael E DeBakey VAMC Bridge Grant (PI: Nowakowski); and VA Airborne Hazards and Burn Pit Center of Excellence Pilot Grant (PI: Nowakowski).

Abstract citation ID: zsad077.0378

0378**A RANDOMIZED, SHAM-CONTROLLED PILOT TRIAL OF A NOVEL NEAR-INFRARED PHOTOTHERAPY DEVICE ON SLEEP AND DAYTIME FUNCTION**Kathryn E.R. Kennedy¹, Chloe C.A. Wills¹, Catie Holt¹, Michael Grandner²¹ University of Arizona, ² Sleep & Health Research Program, Behavioral Sleep Medicine Clinic, University of Arizona College of Medicine

Introduction: Near-infrared (NIR) light delivered transdermally exhibits several therapeutic properties, likely through stimulation of parasympathetic activity. This may aid in relaxation. However, little is known about the benefits to sleep and next-day daytime function. The purpose of this study was to investigate the effects of NIR exposure before bed on sleep and next-day function.

Methods: Thirty adults (30-60 y) with a self-reported sleep complaint but without a sleep disorder participated in a randomized, sham-controlled study for a duration of five weeks. After a two-week baseline period, participants wore a cervical NIR-emitting collar (combined 660nm, 740nm, 810nm, and 870nm) every other night before bed for three weeks. Physical symptoms (including sleep-related experiences) were assessed with the Systematic Assessment of Treatment Emergent Effects (SAFTEE). Insomnia Severity Index (ISI), daily sleep diaries, Oura rings (v2), daily ratings of overall sleep quality and feeling refreshed, and general ratings (0-100) of perceived changes to sleep, relaxation, daytime function, overall performance, and energy levels were also used to examine group differences.

Results: Significant group differences in change scores were seen for SAFTEE total score (-9.4 vs +13.8, $p=0.036$), SAFTEE sleep-related symptoms (-2.9 vs +4.1, $p=0.005$). No differences were seen in ISI scores. No differences were seen for Oura recordings or sleep diary data. Upon examining within-group changes, most instances were consistent (change or no change), with some exceptions: The active group showed decreased sleep latency (-6mins, $p=0.001$), decreased REM% (-0.9%, $p=0.034$), increased average sleep quality (+0.6pts, $p=0.003$) and feeling refreshed (+0.7pts, $p<0.0005$), and a perceived increase in relaxation (17.5pts, $p=0.003$) and daytime function (17.5pts, $p=0.003$), while the sham group did not. The sham group reported decreases in perceived overall performance (18.7pts, $p=0.047$) and energy level (26.0pts, $p=0.023$), while the active group did not.

Conclusion: NIR exposure to the head and neck before bed may offer potential therapeutic benefits to sleep and daytime function, but further work needs to be done to determine optimal dose parameters, wavelengths, and power level.

Support (if any):

Abstract citation ID: zsad077.0379

0379**A SCOPING REVIEW OF VALIDATION STUDIES FOR COMMERCIALLY AVAILABLE CBT-I SMARTPHONE APPLICATIONS**Michael Mak¹, Armin Rahmani²¹ University of Toronto, ² University of British Columbia

Introduction: Cognitive behavioral therapy for insomnia (CBT-I) remains the first line treatment for insomnia. CBT-I in comparison with sedative-hypnotics has similar efficacy, but with treatment durability and almost no adverse effects. Despite

CBT-I being recognized as the best insomnia treatment, access remains limited. Digital CBT-I hopes to address the problem of scale, so as to deliver therapy to the masses. There are now multiple mobile applications available both on smartphone app stores, which claim to deliver evidence based CBT-i. These applications largely come at a cost and patients have to pay to access their services. The goal of this study is to review CBT-i smartphone applications to see if they are indeed validated.

Methods: We performed a search on the two most popular smartphone application platforms: Google Play and Apple Store. We used search terms: sleep, insomnia and CBT-I. We then searched for validation studies for those smartphone applications on Google Scholar. We included studies conducted in the past 10 years. Our second search consisted of reviewing PubMed and Google Scholar for validation studies for CBT-I applications. Our search terms consisted of CBT-I and smartphone, CBT-I and application and CBT-I and digital.

Results: Of the 9 validation studies that we initially found, 6 met our inclusion criteria. 3 were excluded as they did not solely use CBT-I in their applications. All 6 applications reported significant improvement in important sleep quality metrics such as sleep onset latency and total sleep time. 4 studies also reported on a subjective improvement in quality of sleep. 2 studies looked at populations with comorbidities including cannabis use disorder and epilepsy. Both studies again found improvement in sleep quality in those specific populations. There were concerning patterns of bias found amongst the reviewed studies. 3/6 investigators had direct relationships with companies which designed and marketed the applications.

Conclusion: dCBT-I offers an opportunity to increase accessibility to therapy. There are only a limited number of studies which have examined the effectiveness of the applications on the market. There remains serious concerns about the risk of bias and the quality of validation studies which claim to confirm the effectiveness of these applications.

Support (if any):

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0380**ADULTS WITH AND WITHOUT MILD COGNITIVE IMPAIRMENT SHOW SIMILAR TREATMENT ADHERENCE AND SLEEP IMPROVEMENT AFTER INSOMNIA THERAPY**Allison Morehouse¹, Kathleen O'Hara², Beatriz Hernandez¹, Laura Lazzaroni¹, Jamie Zeitzer¹, Leah Friedman¹, Donn Posner³, Clete Kushida⁴, Jerome Yesavage¹, Andrea Goldstein-Piekarski¹¹ Stanford University, ² Department of Psychiatry and Biobehavioral Sciences, Semel Institute for Neuroscience and Human Behavior, University of California, Los Angeles, ³ Sleepwell Consultants, ⁴ Stanford University School of Medicine

Introduction: Non-pharmacological Insomnia Therapies are robustly effective in improving sleep in cognitively intact (CI) older adults. However, it remains unknown whether older adults with mild cognitive impairment (MCI) can engage in insomnia therapy to experience similar sleep improvements.

Methods: We leveraged an existing dataset derived from a randomized clinical trial (NCT02117388) in older adults with and without MCI to examine differences in treatment adherence and sleep improvements after completing six sessions of insomnia therapy. Healthy older adults with insomnia ($n=127$,

Age = 69.18, 34.4% male, MCI: $n=38$ determined by Montreal Cognitive Assessment score < 26) completed a one-week sleep diary at pre-treatment (BL), post-treatment (ET), and six-months post-treatment (6M). Wake after sleep onset (WASO), total sleep time (TST), sleep efficiency (SE), and sleep onset latency (SOL) were calculated from sleep diaries. Treatment consisted of either the behavioral, cognitive, or combined components of Cognitive Behavioral Therapy for Insomnia (CBT-I). Participants rated their treatment adherence at the final treatment session. Linear mixed effects models were used to determine the effect of MCI status, time, and an MCI status-by-time interaction on each sleep outcome while covarying for age and sex. A Benjamini-Hochberg correction was applied to correct for multiple comparisons. Linear regression models controlling for age and sex were used to test group differences in treatment adherence scores.

Results: Both groups showed significant improvements in all sleep measures from BL to ET and sustained these improvements at 6M ($\text{padj}'s < 0.016$). There were no significant MCI status-by-time interactions for any sleep measure ($\text{padj}'s > 0.29$), suggesting individuals with and without MCI similarly improved their sleep. Further, there were no differences in treatment adherence scores between the CI and MCI groups ($b=0.131$, $p=0.432$), suggesting the MCI group engaged in therapy similarly to the CI group.

Conclusion: These preliminary findings suggest older adults with MCI may be capable of engaging in insomnia therapy to improve their sleep to the same degree as CI older adults. These findings also highlight the need of future research investigating the efficacy of non-pharmacological insomnia therapy on sleep and cognitive outcomes in older adults with MCI.

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0381

ADVERSE CHILDHOOD EXPERIENCES ASSOCIATED WITH ADULT SLEEP DURATION, CONTROL OVER SLEEP, AND DAYTIME SLEEPINESS

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Introduction: Adverse childhood events have been linked with many mental and physical health risks, but less work has explored nighttime and daytime sleep problems, especially inability to control sleep.

Methods: Data were obtained from the Sleep and Healthy Activity, Diet, Environment, and Socialization (SHADES) study of $N=1007$ adults aged 22-60 years recruited from communities in southeastern Pennsylvania. Adverse childhood experiences

were defined as a self-reported history of child abuse, parent divorce, parent death, parent with depression, parent with anxiety disorder, and childhood poverty (yes/no). Habitual sleep duration was assessed in hours, daytime sleepiness was assessed with the Epworth Sleepiness Scale (ESS), and control over sleep was assessed with the Brief Index of Sleep Control (BRISC). Covariates included age, sex, race/ethnicity, and education. Additional models included depression severity, assessed using a modified version of the Patient Health Questionnaire-9.

Results: History of child abuse was associated with 23 fewer minutes of nighttime sleep ($p=0.001$), and parent anxiety was associated with 15 fewer minutes ($p=0.048$). When depression was added to the model, the effects for sleep duration were attenuated (15.3 minutes, $p=0.03$). No other relationships were observed. Regarding control over nighttime sleep, decreased sense of control was reported by those who experienced child abuse ($B=-0.4$, $p< 0.0005$), parent divorce ($B=-0.1$, $p=0.035$), and parent depression ($B=-0.2$, $p=0.02$). After adjusting for depression, the relationship with child abuse was attenuated but maintained ($B=-0.2$, $p< 0.0005$). Elevated ESS scores were seen in those who reported child abuse ($B=4.7$, $p< 0.0005$), parent depression ($B=4.3$, $p< 0.0005$), and parent anxiety ($B=3.9$, $p< 0.0005$). After adjusting for depression, relationships were attenuated but maintained for child abuse ($B=2.0$, $p=0.02$), parent depression ($B=2.2$, $p=0.004$), and parent anxiety ($B=2.2$, $p=0.017$).

Conclusion: Adverse childhood events may lead to sleep/wake dysregulation, including less sleep at night, more sleepiness during the day, and decreased sense of control over sleep ability. Future efforts might focus on increasing control over nighttime sleep and reducing daytime sleepiness.

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0382

AGE AT ONSET IN ADULTS WITH INSOMNIA: A LATENT PROFILE ANALYSIS

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Introduction: Research has sought to understand insomnia through identification of subtypes, yet age at onset (AAO) has received limited empirical attention. Across psychiatric disorders, early AAO is associated with higher clinical severity and burden, more persistent course, and greater familiarity, whereas late AAO is associated with comorbid psychiatric and physical illness. We sought to detect clinically distinct AAO subgroups in adults with insomnia utilizing latent profile analysis (LPA).

Methods: Participants were 618 adults aged 18 to 71 years ($M=28.94$, $SD=11.06$) with insomnia, recruited through Prolific Academic. Participants completed an internet survey of demographics, medical/psychiatric history, family history, insomnia onset acuity, and course, causal attributions surrounding insomnia onset, and current insomnia severity and sleep-related impairment. LPA was performed on AAO of clinically significant insomnia (i.e., causing distress or daytime impairment and occurring 3 days per week for at least 3 months). Independent samples t-test and chi-squared test of independence were

performed to compare resulting AAO subgroups on clinical outcomes.

Results: A two-class model (Class 1: $n=547$, 88.5%, Monset=19.2 years; Class 2: $n=71$, 11.5%, Monset=43.5 years) was optimal for forming insomnia AAO subgroups. The late onset group had higher relative insomnia severity, $t=-2.78$, $p=.006$, and sleep-related impairment, $t=-3.75$, $p<.001$. There were no group differences in lifetime prescription sleep medication, $p=.569$, lifetime diagnosis of psychiatric disorder(s), $p=.189$, family history of insomnia, $p=.159$, or insomnia onset acuity (i.e., sudden vs. gradual), $p=.140$. Late onset was associated with higher relative endorsement of hormonal factors, $X^2=12.81$, $p<.001$, bodily arousal, $X^2=8.57$, $p=.003$, scheduling, $X^2=9.08$, $p=.003$, and childhood experiences and traumatic events, $X^2=5.67$, $p=.017$. There were group differences in insomnia course, $X^2=16.35$, $p<.001$, such that early onset was associated with higher relative endorsement of persistent insomnia and late onset was associated with higher relative endorsement of seasonal insomnia.

Conclusion: Findings suggest the presence of an early onset group with higher persistence, but not increased severity and impairment as anticipated, and a late onset group with more seasonal course, numerous causal attributions, and higher insomnia severity and impairment. Future replication is needed to determine the validity and treatment applications of these subgroups.

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0383

AMYGDALA RESTING STATE FUNCTIONAL CONNECTIVITY CHANGE CORRELATES WITH SLEEP EEG BETA POWER IN CHRONIC INSOMNIA DISORDER PATIENTS

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Introduction: Physiological hyperarousal is suggested as a core feature of insomnia and resting-state functional magnetic resonance imaging (rs-fMRI) studies have examined the neurobiological basis of the hyperarousal theory. However, few have investigated the associations between rs-fMRI and the biomarkers of physiological hyperarousal. We aimed to investigate (1) the differences in the resting-state functional connectivity (RSFC) between chronic insomnia disorder (CID) patients and good sleepers (GS), and (2) the relationships between altered RSFC and the hyperarousal biomarkers including electroencephalogram (EEG) and heart rate variability (HRV).

Methods: Fifty CID patients (37 females, 45.8 ± 12.7 years old) and 52 GS (32 females, 37.0 ± 13.2 years old) completed self-report questionnaires, and underwent nocturnal polysomnography and rs-fMRI. We analyzed RSFC in the amygdala (AMYG) and anterior insula (AI), which were core regions of the salience network probably associated with hyperarousal. We also analyzed EEG relative beta power at central derivations and frequency domain HRV parameters (e.g., low frequency and high frequency) in ECG lead II during sleep. We then tested differences in the RSFC between CID and GS and examined the correlations between RSFC, EEG beta power, and HRV.

Results: Compared with GS, CID showed more negative RSFC between the right AMYG and left supramarginal gyrus (SMG), but less positive RSFC between the left AI and bilateral lateral prefrontal cortex (LPFC). The right AMYG-left SMG RSFC was positively correlated with EEG beta power in non-rapid eye movement (NREM) stage 3 sleep measured on central regions (C3: $r=-0.336$, $p=0.012$; C4: $r=-0.314$, $p=0.024$). We did not find any significant correlations between RSFC and HRV parameters.

Conclusion: Decreased RSFC between the AMYG and SMG in insomnia patients may reflect a difficulty in the cortical top-down regulation of the amygdala, indicating hyperarousal during daytime. We also found a significant correlation between the AMYG-SMG RSFC and EEG beta power. This result suggests that altered AMYG connectivity during daytime is associated with cortical hyperarousal during sleep. Overall, our study may provide neurobiological evidence for the 24-hour hyperarousal theory of insomnia.

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0384

ASSESSING THE CONTENT VALIDITY OF THE IDSIIQ THROUGH COGNITIVE INTERVIEWS IN INDIVIDUALS WITH COMORBID INSOMNIA AND NOCTURIA

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Introduction: The Insomnia Daytime Symptoms and Impacts Questionnaire (IDSIIQ) is validated to measure daytime functioning in individuals with insomnia disorder. This study assessed the content validity of the IDSIIQ through cognitive interviews in individuals with insomnia and comorbid nocturia.

Methods: This was a cross-sectional, qualitative observational study. Data were collected from 10 adult subjects from the US suffering from insomnia disorder (DSM-5) and comorbid nocturia (≥ 2 nocturnal voids). One-on-one, web-based interviews were conducted using semi-structured guides and lasted 60–90 minutes. Based on the stage of the study, all participants examined the content validity of the IDSIIQ as part of 1) hybrid concept elicitation and cognitive interviews ($n=5$; Stage 1), or 2) cognitive interviews ($n=5$; Stage 2). Institutional review board approval and web-based informed consent were obtained prior to the patient interviews.

Results: The mean age of participants was 59.5 years ($SD=4.3$) and 62.2 years ($SD=8.5$) in the hybrid and cognitive interview groups, respectively. All individuals in the hybrid interviews were female, whereas all individuals in the cognitive interviews were

male. Participants' overall impressions were positive (10/10), describing the IDSIQ as straightforward (5/10), good (1/10), simple (1/10), very precise (1/10), very specific (1/10), clear (1/10), and aligned with their experience (3/10). The items were understood by all participants (10/10) except Item 1, which was understood by almost all participants (9/10). One participant suggested that the responses to questions on the IDSIQ may vary depending on the time the survey is administered, and the amount of sleep obtained the previous night. All 10 participants reported that they could answer all questions. Of the nine participants who were asked, all stated that the IDSIQ was relevant to their experience of their condition. Most participants reported that there were no missing items, whereas two participants stated that an item assessing the impact of insomnia on personal relationships (including family) was missing.

Conclusion: The content of the IDSIQ was easy to understand by patients that suffer from insomnia and comorbid nocturia. The study provides evidence for the content validity of the IDSIQ and its applicability in this population.

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0385

BEHAVIORAL RELAXATION APPROACHES FOR INSOMNIA IN PREGNANT PATIENTS

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Introduction: Insomnia is a common sleep complaint experienced by 1 in 7 pregnant women (Felder, et al, 2020). In recent years, mindfulness-based interventions have gained popularity among pregnant and postnatal women. We conducted qualitative interviews to explore how pregnant women perceive this type of behavioral intervention and its possible implementation as a smartphone app.

Methods: Participants were identified through OB/GYN physicians at Penn. Research coordinators asked participants questions regarding their perspectives toward a mindfulness-based sleep intervention and experiences related to pregnancy and sleep disturbances. Two study personnel initially identified themes in the responses and assigned each theme to a corresponding numeric value. Then, two other coordinators independently assigned the values to each response. Discrepancies were resolved as a team.

Results: The average age reported amongst the 12 respondents (all pregnant females) was 32 years old (min: 20; max: 39; SD: 4.4). On average, participants were willing to devote about 26 minutes/day to a behavioral intervention for sleep (min: 4; max: 84; SD: 20). Six out of 12 participants reported that stress/worry affects their sleep at least once a month, with two reporting pain and discomfort as also having an impact. All 12 subjects agreed that the use of a behavioral relaxation intervention is an appealing approach to improve sleep. Lastly, 6 out of 12 subjects responded with a willingness to use a behavioral intervention until their expected delivery date with two subjects agreeing to participate but requested stopping several weeks before delivery.

All of the patients felt that implementing the mindfulness behavioral intervention as a smartphone app would increase appeal and accessibility.

Conclusion: Current insomnia medication options are limited for pregnant patients. Our data shows potential for the use of behavioral relaxation therapy as an alternative to improving sleep quality among pregnant women by targeting their experiences with stress. Furthermore, results indicate that a follow-up immediately post-delivery may be impractical due to the adjustment period necessary after giving birth. Future clinical studies will explore developing the app and impact on overall insomnia symptom burden in order to explore its utility as a non-pharmacological, easily accessible option for pregnant patients.

Support (if any):

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0386

BRIEF COGNITIVE-BEHAVIORAL THERAPY FOR INSOMNIA AMONG JAPANESE UNIVERSITY STUDENTS WITH SLEEP DISTURBANCES

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Introduction: Sleep disturbances among Japanese university students negatively affect their academic performance and mental health. Student habits, such as naps and using smartphones in bed, may lead to sleep problems. We hypothesized the Sleep Health through University Student Habits (SHUSH) program, a four-week cognitive-behavioral therapy for insomnia intervention, would improve sleep disturbances in university students.

Methods: We used a pretest-posttest, single arm pilot study design and evaluated the feasibility and preliminary efficacy of SHUSH. Occupational therapy and physical therapy students (N = 18) in a university with self-reported sleep disturbances (Insomnia Severity Index; ISI score ≥ 9) were offered 90-minutes of sleep education (e.g., two-process model of sleep regulation, stimulus control, and sleep hygiene) then prescribed personalized sleep restriction therapy (SRT) and stimulus control therapy (SCT) goals based upon 10-days of sleep diary data. This was followed by weekly 15-minute individualized meetings for three consecutive weeks; SRT and SCT goals were titrated based upon sleep diaries, and occupational therapists supported treatment adherence. Assessments included validated Japanese versions of sleep-related (e.g., sleep disturbance), mental health-related (e.g., depression) and sleep diary (e.g., sleep efficiency) variables. Dependent t-tests (d) and Wilcoxon rank sum tests (r) were used to test differences between baseline and posttest assessments.

Results: There were 15 students who completed SHUSH with a mean age of 19.7 years; 9 were women. Improvements were found in sleep disturbance (r = 0.843), sleep quality (r = 0.851), daytime sleepiness (d = 0.762), sleep hygiene practice (d = 1.216) and change from an eveningness towards a morningness circadian preference (d = 0.990). Anxiety (d = 0.604) and depression (d = 0.729) improved. Sleep onset latency (r = 0.851), nighttime awakening (r = 0.514), and sleep efficiency (r = 0.880) also improved. Participants were satisfied with the SHUSH

group-based education, one-on-one therapist meetings, and program brevity; there were no adverse events.

Conclusion: SHUSH is a feasible and preliminarily effective sleep improvement program for reducing sleep disturbances among Japanese university students. Improved sleep was associated with improved mental health and sleep-promoting behaviors. A randomized controlled trial of SHUSH is recommended.

Support (if any): Fulbright U.S. Scholar Award to Japan

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0387

BURDEN OF INSOMNIA AMONG ALZHEIMER'S PATIENTS: VARIATIONS IN COMORBIDITIES AND HEALTHCARE UTILIZATION IN MEDICAID ENROLLEES

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Introduction: Sleep disturbance contributes to the burden of Alzheimer's disease (AD), specifically among vulnerable patients with behavioral symptoms and multiple comorbidities. Limited information exists regarding the characteristics associated with insomnia among patients with AD. This study describes medical conditions and healthcare utilization among patients with AD and insomnia.

Methods: This retrospective cohort study used MarketScan® Multi-State Medicaid Database 2016-2020 and included adults aged ≥ 50 with newly diagnosed AD. Index date was the earliest medical or pharmacy claim date for insomnia within 3 months prior to 12 months post AD date. For comparison, non-insomnia cohort was selected based on propensity score 1:1 matching. Comorbid conditions and behavioral symptoms (BS) - including agitation/aggression, psychotic symptoms, and mood disorders - and delirium were measured in the 12-month baseline period and were compared across insomnia and non-insomnia cohorts using chi-square tests. Healthcare utilization was assessed in 12-month post-index date (follow-up period).

Results: Among patients with incident AD, significantly higher proportions of individuals with comorbidities were detected in insomnia (N=3,904) vs. non-insomnia (N=3,904) cohorts in 12-month baseline period, i.e., hypertension (76.2% vs. 71.2%, $p < 0.001$), diabetes (35% vs. 32.9%, $p=0.05$), valvular disease (11.6% vs. 9.8%, $p=0.01$), delirium (5.1% vs. 3.7%, $p=0.002$) and BS (62.4% vs. 46%, $p < 0.0001$). The proportion of patients with BS during follow-up was higher in the insomnia cohort (76.18%) in comparison to the non-insomnia cohort (53.53%). In the follow-up, proportion of inpatient, emergency room and physician office visits were 34.5%, 49.8%, 45.6% in insomnia and 30.7%, 42.5%, 41.2% in non-insomnia cohorts respectively. Mean (SD) inpatient length-of-stay was 3.2 (9.62) days for insomnia and 2.6 (8.52) days for non-insomnia cohorts respectively.

Conclusion: The study results indicate that major comorbidities and behavioral symptoms are highly prevalent among insomnia patients with AD. Insomnia is associated with higher utilization rates when healthcare use is compared

between insomnia and non-insomnia patients. Optimization of insomnia treatment is crucial for the disease management in AD patients.

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0388

COMPARISON OF OBJECTIVE AND SUBJECTIVE SLEEP EVALUATIONS BASED ON WITH OR WITHOUT INSOMNIA SYMPTOMS AMONG JAPANESE CITY EMPLOYEES

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Introduction: Discrepancies between subjective and objective assessments of sleep duration and onset latency have been reported among insomnia patients. However, such discrepancies have not been well studied in the general population or working populations with sleep EEG measurements. The aim of this study was to compare subjective and objective assessments of sleep at home in a working population.

Methods: Between 2017 and 2019, a questionnaire survey including the Athens Insomnia Scale (AIS) and home 1-Ch electroencephalograph (EEG) measurements were conducted among municipal employees in Koka, Shiga Prefecture, Japan (NinJaSleep study). Sleep duration and sleep onset latency (SL) on weekdays answered in the questionnaire were used as the subjective evaluation. Sleep duration and SL determined with 1-Ch EEG were used as the objective evaluation. AIS ≥ 6 was defined as having insomnia. The study protocol was approved by the Ethics Committee of the Shiga University of Medical Science.

Results: 646 employees (44.7 ± 11.5 years, AIS: 5.4 ± 3.6 points) participated in the study. In the with-insomnia group (AIS ≥ 6 , n=274), no significant difference was found between subjective and objective sleep duration (347.1 ± 75.8 min vs. 355.1 ± 78.9 min, $p=0.153$), and subjective SL was longer than objective SL (24.5 ± 20.2 min vs. 19.5 ± 18.8 min, $p=0.002$). In the without-insomnia group (AIS < 6 , n=372), no significant differences were found between subjective and objective evaluations in both sleep duration (372.3 ± 64.6 min vs. 369.9 ± 78.6 min, $p=0.597$) and SL (18.9 ± 15.8 min vs. 16.9 ± 12.3 min, $p=0.259$).

Conclusion: In the with-insomnia group, subjective SL was perceived longer than the objective SL. No differences were found between subjective and objective sleep duration both in with and without insomnia groups, which may come from the study performed in a working population.

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0389

CO-SLEEPING WITH PETS DOES NOT WORSEN INSOMNIA SYMPTOMS AMONG US VETERANS WITH SLEEP DISORDERS

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Introduction: Little is known about the association of pets and insomnia symptoms among US veterans. The aim of this study was to examine the association between pets sleeping in the bedroom environment and insomnia symptoms in a sleep clinic cohort of US veterans.

Methods: The sample consisted of US veterans at risk for sleep apnea (SA) evaluated at the Miami VA Sleep Center between 9/2019 and 10/2020. Veterans completed home polysomnography and questionnaires which queried demographics, pet characteristics, insomnia (insomnia severity index [ISI]), and mental health symptoms (PROMIS-29 anxiety and depression). Three linear regression models were constructed evaluating the associations between pet ownership (pet sleeping in bedroom or bed vs no pet) and a) total ISI score, b) nocturnal symptoms only (first 3 ISI items), c) daytime impairment symptoms (last 4 ISI items). Models were adjusted for relevant covariates (age, gender, race, apnea-hypopnea index, depression, anxiety, during or before COVID).

Results: The sample consisted of 411 veterans (age 51 ± 14 , BMI 32 ± 6 Kg/m², 41% black, 87% male). Sixty-seven veterans (16%) reported sleeping with a pet in the bedroom (57% co-sleeping with their pet). Of these, 19% sleep with a cat, 76% sleep with a dog, 6% sleep with both, and 31% sleep with multiple pets. The mean ISI was 18 ± 7 while the mean AHI 21 ± 19 events / hour, and 81% of the sample had SA. In adjusted analyses, relative to veterans without pets, sleeping with a pet in the bedroom (outside of the bed) was not associated with any insomnia symptoms. However, co-sleeping with a pet in bed was associated with a lower total ISI ($\beta = -2.1$, $p = 0.032$) and less daytime impairments ($\beta = -1.5$, $p = 0.016$), but co-sleeping with a pet was not associated with nocturnal insomnia symptoms.

Conclusion: Among veterans with a high prevalence of SA, co-sleeping with pets in bed mitigated daytime impairments and did not worsen nocturnal insomnia symptoms. Further studies are needed to clarify the mechanisms of why co-sleeping with pets may lessen daytime impairments among veterans with SA and insomnia complaints.

Support (if any): None

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0390

CRACKING THE EEG CODE ON INSOMNIA: HOW ODDS RATIO PRODUCT ARCHITECTURE RELATES TO NUMBER OF INSOMNIA SYMPTOMS

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Introduction: Objective markers of insomnia have remained largely elusive. Odds ratio product (ORP; a marker of objective sleep quality), is currently being investigated for a potential role in assisting in insomnia diagnosis. Recent research has shown how patients with insomnia may present with hyperarousal and

may be identified by looking at ORP architecture. In the current study, we aimed to investigate how ORP architecture, and specifically time spent in the lowest two (deep sleep) and last decile (full wakefulness) of ORP, relate to the number of insomnia symptoms.

Methods: 403 participants (age 46.3 ± 12.3 , range 18-79, 172 females) recorded their sleep with in-home PSG using the Cerebra Sleep System and completed sleep questionnaires. Sleep quality was measured using the odds ratio product (ORP) derived from micro-analyzing frontal EEG channels. On the questionnaires, participants reported whether they experienced any of the following insomnia symptoms at least three times a week: trouble falling asleep, trouble staying asleep, and waking up too early. Statistical analyses included number of insomnia symptoms as a dependent variable in a multiple linear regression, time spent in the lowest two deciles of ORP and the highest decile of ORP as independent variables, and age as a covariate in a separate model.

Results: 60 participants reported 1 symptom of insomnia, 82 reported 2 symptoms, and 68 reported 3 symptoms. The full model was significant ($F_{2,399}=4.675$, $p=0.010$, $R=0.228$, $R^2_{adj}=0.052$) and indicated that time spent in the highest decile of ORP was the only significant predictor of number of insomnia symptoms ($t_{399}=2.321$, $p=0.021$, $\beta=0.131$) after controlling for age. Time spent in the lowest two deciles of ORP (deep sleep) was not a significant predictor ($p > 0.05$).

Conclusion: Time in the highest ORP decile, indicative of full wakefulness, is positively associated with insomnia symptoms after controlling for age. Individuals reporting more insomnia symptoms spent more time in full wakefulness. Time spent in deep sleep was not associated with insomnia symptoms. This may indicate hyperarousal and low sleep drive in participants with subjective insomnia complaints, which is consistent with insomnia etiology.

Support (if any):

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0391

DEMOGRAPHIC AND CLINICAL CHARACTERISTICS, AND INSOMNIA SEVERITY SYMPTOMS IN CANCER SURVIVORS WITH INSOMNIA SYMPTOMS

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Introduction: More than 50% of cancer survivors suffer from insomnia symptoms before, during or after cancer treatments, which may eventually progress to an insomnia disorder if not addressed. The current study aims to identify which of the demographic and clinical characteristics relate to subthreshold and clinical insomnia categorized according to Insomnia Severity Index (ISI), among heterogeneous sample of cancer survivors with insomnia symptoms (ISI score > 7).

Methods: Baseline data from participants ($n=136$) from an ongoing trial were used. All participants completed demographic and clinical characteristic assessments (e.g., ISI, Pittsburgh Sleep Quality Index [PSQI], Hospital Anxiety and Depression Scale [HADS], 7-day sleep diary). Descriptive statistics were calculated for demographic and clinical variables. Bivariate comparisons of these variables by insomnia subgroups (subthreshold vs. clinical insomnia) were performed using Fisher's exact test.

Results: The sample included 60 breast, 48 prostate, 19 colorectal, and 7 lung cancer survivors (55.9% female; age=63.8 y, range: 32-82; 87.5% White; BMI=27.9±6.1 kg/m²). The analytical sample (n=134) comprised of 64.7% (n=88) subthreshold and 33.8% (n=46) clinical insomnia subgroups. Those in subthreshold subgroup consisted of more females (n=54, 40.3% vs. n=20, 14.9%), ≥ 65 y (n=51, 38.1% vs. n=22, 16.4%), and >25 BMI (n=55, 41.0% vs. n=35, 26.1%) than those in clinical subgroup. No statistically significant association between previously discussed variables were found. Both subthreshold and clinical insomnia groups had higher number of those with poor sleep quality than good, and sleep efficiency less than 85% than those with ≥85%, by PSQI and sleep diary, respectively. Of the subthreshold subgroup, 87 (64.9%) were identified as having no symptoms of depression, and 80 (59.7%) as having no anxiety, compared to those with symptoms. This was similar for the clinical subgroup where 37 (27.6%) had no symptoms of depression and 27 (20.1%) with no anxiety, compared to those with symptoms. There were statistically significant associations between insomnia subgroups and depression (p<.001) and anxiety (p<.001), respectively.

Conclusion: Preliminary descriptive findings highlight significant characteristics of cancer survivors with subthreshold and clinical insomnia. More clinical symptoms were present among clinical insomnia group. PSQI may identify poor sleepers in cancer survivors.

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0392

WITHDRAWN

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0393

DURABILITY OF TREATMENT EFFECTS FOR A STEPPED-CARE MODEL INTEGRATING DIGITAL THERAPY FOR INSOMNIA

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Introduction: A stepped-care model going from digital cognitive behavioral therapy for insomnia (dCBT-I) to clinician-led CBT-I (fCBT-I) has been shown to be acutely effective. However, the sustainability of the effects over longer periods of time has not yet been examined. This study tested the durability of treatment effects of this stepped-care approach two years following the end of treatment.

Methods: 1018 individuals with insomnia (DSM-5 diagnostic criteria) were randomized into two conditions at step 1: dCBT-I (N=613), or an online sleep education control (N=624). Participants in the dCBT-I condition who did not remit (ISI>9) were further randomized to either face-to-face CBT-I (N=103) or sleep education (N=104). Insomnia remission and treatment gains at 2-year follow-up were compared across treatment conditions.

Results: Among step-1 non-remitters, odds of insomnia remission for those who stepped-up to fCBT-I was almost three times higher (60% in remission) than those who received the step-2 control (33% in remission), OR = 2.95, 95% CI [1.3, 6.7]. Odds of remission was not significantly different between those who

remitted at step-1 (64% in remission at year 2) and those who received fCBT-I, OR = 3.53, 95% CI [1.7, 7.5]. The treatment gains were higher in the fCBT-I group (9.6 point improvement from baseline) compared to those who remitted at step-1 (7.7 point improvement from baseline) (Cohen's d = 0.44).

Conclusion: Preliminary evidence indicate that the treatment effects of this stepped-care model are durable two years after treatment.

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0394

EFFECT OF ELECTRICAL VESTIBULAR NERVE STIMULATION ON SLEEP QUALITY IN YOUNG ADULTS WITH INSOMNIA: A RANDOMIZED CONTROLLED TRIAL

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Introduction: Insomnia is a common sleep disorder among all age groups which adversely affects physical and mental health. Young adults are considered a high-risk population group due to increased use of electronic media at bedtime, stress associated with balancing educational demands and unhealthy sleep practices. Previous research suggests that electrical vestibular nerve stimulation (VeNS) may improve sleep outcomes by influencing the hypothalamus and brainstem nuclei involved in regulating the circadian rhythm and wakefulness. The present study is a randomised, double blinded, sham-controlled trial with the aim of assessing the efficacy of VeNS on the sleep quality of young adults suffering from insomnia.

Methods: Eighty adults aged 18-24 years who scored 15 or higher on the Insomnia Severity Index (ISI) were recruited. Participants assigned to the intervention group (n=40) received 30 minutes per day of VeNS with 5 sessions per week for 4 weeks, while the control group (n=40) received sham stimulation for the same period. ISI scores were recorded at baseline and repeated weekly. The primary outcome was between-group change in ISI from baseline to day 28. Secondary outcomes included between-group change in the emotional states of depression, anxiety and stress measured by the DASS-21 questionnaire, and quality of life (QoL) measured by the WHOQoL-BREF.

Results: A group-by-time interaction effect on change in ISI score from day 0 to day 28 (F3, 248 = 295.56; P< 0.001) was observed. The intervention group had a higher reduction in mean ISI score relative to the control group at day 28 (mean change [95% CI]: 7.23 [6.78, 7.67] vs. 0.98 [0.89, 1.06], P< 0.001; respectively). Furthermore, the intervention group showed improvements in depression, anxiety, and stress scores (P< 0.001) and QoL outcomes (P< 0.001) compared with the control group.

Conclusion: Regular VeNS usage over 4 weeks lead to a clinically meaningful decrease in ISI scores and improved general well-being in young adults with insomnia. VeNS may have potential as a drug-free and non-invasive therapy to improve sleep outcomes.

Support (if any):

Abstract citation ID: zsad077.0395

0395**EFFECTS OF INSOMNIA AND REST-ACTIVITY ON HOSPITALIZATIONS AND EMERGENCY DEPARTMENT VISITS IN PEOPLE WITH STABLE HEART FAILURE**

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Introduction: People with heart failure (HF) have frequent hospitalizations, and emergency department (ED) visits. We examined the effects of insomnia and rest-activity rhythms (RARs) on time to hospitalizations and ED visits after controlling for other known risk factors among participants in a randomized controlled trial of cognitive behavioral therapy for insomnia compared to heart failure self-management education (attention control).

Methods: The analysis included 168 HF patients who had available medical records for dates of hospitalization, ED visit, transplant, and death from a randomized clinical trial for insomnia of people with HF and insomnia. The known risk factors included age, sex, New York Heart Association (NYHA) Class, ejection fraction, and comorbid conditions. We used the insomnia severity index (ISI) and evaluated the strength of RAR using the ratio of the amplitude to the MESOR estimated with cosinor analysis with activity counts from a wrist-actigraph worn for at least five consecutive days. Cox proportional hazard models were used to examine insomnia and the RAR metrics with the known risk factors on time to first hospitalization, ED visit, transplant, and death.

Results: Eighty-five (50.1%) had at least one hospitalization, and ninety-one (54.2%) participants had an ED visit. Approximately 42% of the participants were admitted to the hospital due to cardiac events. Older age, male sex, higher NYHA, and greater comorbidity were associated with earlier hospitalization or ED visits. After controlling for those risk factors, stronger RAR was associated with later time to hospitalization, and ED visit with hazard ratios (HRs) of 0.26 (95% CI=[0.07, 0.91]) and 0.25 (95% CI=[0.07, 0.89]); higher insomnia severity (ISI ≥ 22) was associated with shorter time to ED visits, with an HR of 2.28 (95% CI=[1.19, 4.38]).

Conclusion: In addition to known demographic and clinical risk factors, insomnia severity and RAR predict hospitalizations and ED visits in people with HF. Further research is necessary to assess the biological mechanism of the associations and examine whether the effects of the risk factors could be modified by improving insomnia severity and RAR in people with HF.

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0396**EFFICACY OF ELECTRICAL VESTIBULAR NERVE STIMULATION FOR THE MANAGEMENT OF INSOMNIA: A RANDOMIZED CONTROLLED TRIAL**

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Introduction: Insomnia is one of the most prevalent health concerns in the general population. Cognitive behavioural therapy (CBT) and pharmacological interventions are recommended for the treatment of insomnia. However, CBT can be expensive and difficult to access, while the use of pharmacotherapy can be limited by reports of adverse events. Due to these limitations, there is a strong need for alternative measures to manage insomnia. Preliminary research indicates the potential that electrical vestibular nerve stimulation (VeNS) has as a non-invasive method for managing insomnia. The aim of this study is to evaluate the efficacy of VeNS as a method of managing sleep quantity and quality in individuals with insomnia, as compared to a sham control.

Methods: The study was a two-armed, double-blind randomized controlled trial that was conducted across two research sites in the United Kingdom (UK) and Hong Kong (HK). Participants aged over 18 years with an Insomnia Severity Index (ISI) score of 15 or higher were randomly assigned to intervention and control groups. The intervention group was instructed to use the VeNS device at home for 30 minutes daily for 4 weeks, while the control group was instructed to use the sham device for the same period. ISI values were captured at baseline, at 2 weeks and at 4 weeks. Sleep quality and quality of life (QoL) were assessed at baseline and at 4 weeks using the Pittsburgh Sleep Quality Index (PSQI) and the 36-item Short Form Health Survey (SF-36), respectively.

Results: A total of 146 participants were recruited from the HK (n=94) and UK (n=52) research sites. The study has recently been completed with the statistical analysis ongoing. The between-group change in ISI values (primary outcome), sleep quality and QoL from baseline to week 4 will be examined.

Conclusion: The results of this study will help determine whether the relatively inexpensive, and non-invasive technique of VeNS is effective in the management of insomnia. The data collected will be used to support regulatory submissions, primarily to the US Food and Drug Administration.

Support (if any):

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0397**EFFICACY OF SECOND-STAGE CLINICIAN-LED CBTI IN NON-RESPONDERS TO DIGITAL CBTI: IS ALLEVIATION OF COGNITIVE AROUSAL A MECHANISM?**

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Introduction: Cognitive-behavioral therapy for insomnia (CBTI) is first-line treatment for insomnia, but a provider shortage limits its access. eHealth technology can increase access to behavioral

interventions, and digital CBTI (fully automated programs) are effective. However, >50% of digital CBTI patients do not remit, and non-remission is linked to undertreated cognitive arousal, a central feature of insomnia. In a randomized controlled trial, we randomized digital CBTI non-remitters to second-stage clinician-led CBTI or control. We evaluated whether second-stage CBTI effectively reduced insomnia and depression, and tested whether reductions in cognitive arousal mediated these effects.

Methods: 207 patients whose insomnia did not remit with digital CBTI presented to second-stage therapy. Patients were randomized to clinician-led CBTI or sleep education control via telemedicine. Study outcomes included insomnia (insomnia severity index, ISI), depression (quick inventory of depressive symptomatology self-report 16-item survey, QIDS-SR16), and three indices of cognitive arousal (pre-sleep arousal scale's cognitive factor [PSASC], perseverative thinking questionnaire [PTQ], and daytime insomnia symptoms response scale [DISRS]).

Results: Before second-stage therapy, all patients reported clinically significant insomnia ($ISI \geq 10$), 13.0% reported moderate depression, and 69.5% reported high cognitive arousal. Step 2 CBTI patients, relative to Controls, reported larger decreases in ISI (-6.43 ± 4.31 vs -2.58 ± 4.83 , $t=6.05$, $p<.001$, Cohen's $d=.84$). At posttreatment, 56.3% of Step 2 CBTI patients remitted ($ISI \leq 7$) relative to just 16.3% of Controls ($X^2=35.77$, $p<.001$, $RR=3.45$). CBTI patients reported larger reductions in depression relative to control, which was a small-to-medium effect (-2.63 ± 3.11 vs -1.11 , $t=3.15$, $p=.002$, Cohen's $d=.44$). Contrary to hypotheses, Step 2 CBTI did not reduce cognitive arousal relative to Control as measured by the PSASC ($p=.195$), PTQ ($p=.840$), and DISRS ($p=.643$).

Conclusion: Clinician-led CBTI is effective for alleviating symptoms of insomnia and comorbid depression in insomnia patients who do not initially remit with digital CBTI. Contrary to hypotheses, reducing cognitive arousal did not mediate treatment effects. As most insomnia non-remitters present to second-stage therapy with high cognitive arousal, alternative approaches that better target cognitive arousal symptoms may represent viable second-stage therapy options for insomnia.

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0398

EFFICACY OF SUVOREXANT FOR INSOMNIA DISORDER IN PATIENTS WITH POORLY-CONTROLLED TYPE 2 DIABETES

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Introduction: Sleep disturbance is a common and underappreciated feature of diabetes and sleep may contribute to glycemic control in patients with type two diabetes (T2D). We conducted a randomized placebo-controlled 3-month trial to examine the efficacy of suvorexant in improving sleep and other aspects of health in patients with suboptimally-controlled type 2 diabetes and insomnia.

Methods: This double-blind, randomized placebo-controlled 3-month trial was conducted using the sequential parallel comparison design (SPCD). Sixty-nine poorly-controlled T2D patients ($HbA1c \geq 6.5$) were randomized to placebo and/or suvorexant (10-20 mg). The primary outcome was subjective total

sleep time (STST), and secondary outcomes were Insomnia Severity Index (ISI) score and wake time after sleep onset (WASO). Exploratory outcomes included sleep efficiency, hemoglobin A1c (HbA1c), and C-reactive protein (CRP). Exploratory analyses were conducted on relationships of sleep and diabetes outcomes.

Results: There were no significant improvements in STST, ISI, or WASO among patients taking suvorexant compared to those taking placebo. There were also no significant changes in any of the exploratory endpoints. Improvements in sleep were associated with improvements in both objective (i.e. HbA1c) and subjective (i.e. Diabetes Distress Scale) measures of diabetes, across treatment assignments.

Conclusion: Our negative findings for suvorexant efficacy for insomnia in poorly-controlled T2D may be related to inadequate sample size or due to the complex and multiple contributions to insomnia in this patient population. The associations of improved sleep with improvements in diabetes-related metrics across groups highlights the importance of identifying and treating sleeping difficulties in this population.

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0399

EXAMINING INSOMNIA TREATMENT ADHERENCE AND OUTCOMES IN BLACK WOMEN VETERANS

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Introduction: Black identified women and veterans consistently experience disproportionately higher rates of insomnia. Cognitive behavioral therapy for insomnia (CBT-I) improves sleep outcomes, although higher rates of attrition and sub-optimal adherence in these groups can limit symptom improvement. Few studies have examined CBT-I treatment adherence and outcomes in women veterans, particularly among those who identify as black. . The current study examined differences in adherence and treatment outcomes in Black identified women veterans compared to white identified women veterans who engaged in CBT-I.

Methods: As part of a larger clinical trial (NCT02076165), 26 black and 25 white women veterans with insomnia disorder completed a 5-session CBT-I program. Insomnia Severity Index (ISI) and sleep diaries were completed at baseline, post-treatment, and 3-month follow-up. Multiple and fractional regression models were used to evaluate the association between race and change in ISI, change in sleep diary sleep efficiency (SE), and adherence to bedtime and rise time during CBT-I.

Results: Mean change from baseline to 3-month follow-up in ISI score for black and white women were -7.31 and -7.97 and

mean change in diary SE was +14.9% and +10.8%, respectively. Race did not impact change-scores for ISI or SE ($1.09 < F < 1.8$, $p > .05$); however, in the fractional regression model, ($X^2=6.9$, $p=.008$; pseudo $R^2=.058$) race was a significant predictor ($OR=.27$, $p=.009$) of adherence to prescribed bedtime in the second week of CBT-I, with black women less likely to adhere to prescribed bedtime than women. Race was not a significant predictor of wake time adherence.

Conclusion: Both black and white women veterans benefitted from CBT-I; however, early adherence to the recommended sleep schedule was lower in black women. Future research could expand on these findings by examining potential barriers in early adherence to recommendations, and how to improve early adherence to ensure that therapy meets the needs of all patients.

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0400

EXAMINING THE EFFECTIVENESS OF TELEHEALTH DELIVERED COGNITIVE BEHAVIORAL TREATMENT OF INSOMNIA

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Introduction: Cognitive behavioral therapy for insomnia (CBT-I) has been shown to be an effective tool in improving symptoms of insomnia, however access is limited. One option for increasing access is the use of telehealth. We conducted a randomized trial comparing CBT-I delivered in-person to over video telehealth and found that telehealth treatment was non-inferior on self-reported insomnia severity. The objective of this study was to extend this analysis to secondary outcomes of subjective and objective measures of sleep as further assessment of the efficacy of telehealth compared to in-person treatment.

Methods: Individuals with DSM-5 insomnia disorder ($n=60$) were randomized to telehealth CBT-I, in person CBT-I, or 8-week waitlist control, although this analysis only compared the CBT-I groups. CBT-I was delivered over 6-8 weekly sessions by video telehealth or in-person in an outpatient clinic. Follow-up assessment was at 2 weeks post-treatment. Both objective and subjective outcomes of sleep efficiency (SE), sleep onset latency (SOL), wake after sleep onset (WASO), and total sleep time (TST) were collected via actigraphy and sleep diaries. Random effects mixed models were used to determine the effects of group, treatment, and their interaction.

Results: The mean change in SE, SOL, WASO, and TST for objective measures from baseline to follow-up was 0.43% and -17.7 minutes, -6.8 minutes, -31.0 minutes, respectively, for in person CBT-I and 0.01%, -15.1 minutes, -2.1 minutes, -9.5 minutes, respectively, for telehealth. For subjective measures, the mean change was 0.16% and -27.0 minutes, -22.7 minutes, 28.9 minutes, respectively, for in person CBT-I and 0.15%, -23.4 minutes, -23.4 minutes, 51.6 minutes respectively for telehealth. The differences between the CBT-I groups were not statistically significant, nor were there significant interaction effects.

Conclusion: In both objective and subjective measures of insomnia, there is no evidence that outcomes from telehealth

delivery of CBT-I is worse than in person treatment. Subjective effects were much larger than objective effects for insomnia possibly indicating a discrepancy between how sleep and more particularly insomnia is perceived by oneself and measured in the lab.

Support (if any): This research was supported by grant 167-SR-17XYZ from the American Sleep Medicine Foundation and a Doris Duke Charitable Foundation Clinical Scientist Development Award.

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0401

FACTORS ASSOCIATED WITH INSOMNIA IN MALE UNIVERSITY STUDENTS

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Introduction: University students can experience high levels of stress, and this can impact sleep quality and increase insomnia symptomology. Little research has investigated insomnia in male university students. This study examined factors associated with insomnia in male students to address concerns and direct resources.

Methods: Male students aged 18-35 at Memorial University completed an online survey. The Insomnia Severity Index (ISI) was used as the dependent variable to measure insomnia. Participants self-reported demographic and academic variables and also completed the Morning Evening Questionnaire (MEQ), Mindful Attention Awareness Scale (MAAS), Medical Outcomes Study Social Support Survey (MOS-SSS), Kessler Psychological Distress Scale (K10), and indicated sleep medication and stimulant use. Univariate and multivariate linear regressions were used to examine the relationship between insomnia and demographic factors, chronotype, social support, mindfulness, psychological distress, and sleep medication and stimulant use.

Results: The majority of participants ($n=564$; Mage = 23) were white (77.8%), undergraduates (76.3%), and enrolled full-time (90.7%). The mean insomnia severity score was 7.7 ($SD = 5.42$). Overall, 46% scored in the no insomnia range, 36% scored in the subthreshold insomnia range, 16% scoring in the clinical insomnia (moderate severity) range, and 2% scored in the clinical insomnia (severe) range. At the univariate level, sleep medication use ($\beta = -.275$, $p < .001$), stimulant use ($\beta = -.158$, $p < .001$), chronotype ($\beta = -.344$, $p < .001$), social support ($\beta = -.244$, $p < .001$), mindfulness ($\beta = -.409$, $p < .001$), and distress ($\beta = .577$, $p < .001$), were significantly associated with insomnia symptom severity. In the multivariate model (Adjusted $R^2 = .40$, $p < .001$), only evening chronotype ($\beta = -.195$, $p < .001$), greater distress ($\beta = .429$, $p < .001$), and sleep medication use ($\beta = -.139$, $p < .001$) remained significantly related to insomnia.

Conclusion: This study identified factors associated with insomnia in male university students. Addressing insomnia, particularly in those with evening chronotype and those who use sleeping medication, may improve psychological distress and the overall well-being of male university students.

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0402

FACTORS ASSOCIATED WITH SUBJECTIVE SLEEP PROBLEM AND TREATMENT WILLINGNESS IN SLEEP CLINIC PATIENTS

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Introduction: Insomnia clinic physicians often encounter patients with discrepancy between subjective and objective sleep problem. This study aimed to investigate factors that attributed to patients' perception of sleep disturbances and treatment willingness, which were practical in determining diagnostic and treatment direction.

Methods: This study was a cross-sectional study, data collected from November 2018 to October 2022 in sleep clinic of tertiary university-affiliated hospital. Adults older than 19 who underwent sleep questionnaires and polysomnography (PSG) were included (n=3,239). Demographic data and sleep-related factors (alcohol, caffeine, exercise, education, job, marital status, comorbidity) were collected. Subjects were categorized into four groups by questionnaire answers (Do you think you have sleep problem? Do you want treatment for sleep problem? -group 1, neither; group 2, no sleep problem but want treatment; group 3, yes sleep problem without treatment willing; group 4, both yes.) and compared.

Results: Group 2 had higher percentage of job, snoring, witnessed apnea, worry about sleep, sleep maintenance problem than group 1. Group 3 had less job, sleep maintenance problem, daytime dysfunction, worry about sleep than group 4 ($p < 0.05$). Majority of no sleep problem groups were revealed to be normal (group 1: 28.0%, 2: 28.5%) or OSA (group 1: 63.7%, 2: 63.1%), while yes sleep problem groups were relatively higher combined insomnia and OSA (COMISA) (group 3: 20.0%, 4: 23.8%) or insomnia (group 3: 11.1%, 4: 15.3%) by PSG. OSA patients in group 2 showed more witnessed apnea and worry about sleep than group 1. COMISA patients in group 3 had less daytime dysfunction than group 4. However, PSG parameters were not significantly different among groups.

Conclusion: This study found that social need and subjective sleep maintenance problem are key factors that lead patients to regard their sleep as problematic or seek for treatment. In particular, patients with suspected OSA need to be instructed to get sleep study since sleep apnea severity do not affect treatment willingness and they had the lowest insight of their sleep problem. For those complaining of no or mild problem yet seeks for treatment, focusing on relieving misperceived worries about sleep is needed.

Support (if any):

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0403

FUNCTIONAL CONNECTIVITY OF BRAIN NETWORKS PREDICTS POLYSOMNOGRAPHICALLY MEASURED SLEEP

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Introduction: The arousal hypothesis predicts that increased cognitive and somatic arousal interfere with sleep among patients with insomnia. Evidence suggests that the connectivity of the

brain's default mode network (DMN) may play an important role in this process. Here, we examined the association between whole cortex resting state functional connectivity and subsequent polysomnographically (PSG) assessed sleep the same night in a sleep laboratory among individuals with documented insomnia.

Methods: We collected data from twenty participants (12 female; age=26.9, SD=6.6 years) meeting criteria for insomnia/sleep disorder. Each participant completed a baseline resting state functional connectivity (rsFC) scan in the early evening and then retired to their own private bedroom in a sleep laboratory. Participants were monitored throughout the night with polysomnography and evaluated for various sleep parameters. Data were analyzed using the CONN Toolbox, v17f. Total Sleep Time from PSG was extracted and entered as a covariate into the whole brain connectivity analysis. Connectivity across the regions identified in the Automated Anatomical Labeling Atlas was assessed using the ROI-to-ROI analysis approach, with a peak signal threshold of $p < .001$ (uncorrected) and False-Discovery-Rate (FDR) correction seed level correction. We focused on the anterior and posterior medial regions of the DMN.

Results: The analysis showed that TST was significantly negatively correlated with numerous regions throughout the brain ($p < .05$, FDR corrected), while there were no regions of positive connectivity. Consistent with our hypothesis, we found that greater TST was associated with anticorrelated activation between the anterior cingulate cortex and regions associated with language processing (i.e., Heschl's gyrus), sensory motor function (precentral and postcentral gyri), superior temporal gyrus, parietal occipital gyrus, temporal pole, and occipital cortex.

Conclusion: Findings suggest that the connectivity of the anterior DMN with language, sensory, motor, and emotional processing regions is related to subsequent PSG measured sleep. Prior work has suggested that stronger anticorrelations between the DMN and task-positive regions is associated with better cognitive performance. Our findings also suggest that stronger anticorrelations between the anterior DMN and these other cortical regions are highly related to sleep among individuals with insomnia.

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0404

HEART FAILURE NURSES' PERCEPTIONS OF COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA AND THE FEASIBILITY OF PROVIDING IT TO PATIENTS

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Introduction: People with heart failure (HF) often report insomnia. Despite strong evidence to support treatment with Cognitive Behavioral Therapy for Insomnia (CBT-I), few with HF have access to CBT-I programs. Access may be improved if it is offered where HF patients receive their medical care, but little is known about the feasibility of doing so. The purpose of this focus group study was to explore HF Nurses' perceptions of: the importance of insomnia and the value of CBT-I to their patients; the feasibility of making CBT-I available in clinic settings and its delivery by HF nurses; and preferences for alternative modes of delivery.

Methods: We used a descriptive qualitative study design. We recruited focus group participants via electronic invitation to members of the American Association of Heart Failure Nurses

and through requests to local nurse collaborators to distribute within their networks. We conducted virtual focus groups. After providing a brief description of the components of CBT-I and its efficacy in the HF population, we elicited participant perceptions of the value of providing CBT-I for HF patients in the clinic setting, facilitators and barriers to implementation, and ways to increase access to CBT-I. We audio-recorded the focus group discussions and used a professional transcription service. Two researchers coded the data and performed thematic content analysis.

Results: We conducted four focus groups with registered nurses and advanced practice nurses employed in HF clinics (N=23). Nurses endorsed the importance of sleep to HF patients, their interest in addressing sleep, perceived benefits of CBT-I, and the need for increased resources to address sleep in the clinic setting. They favored multiple modes of CBT-I delivery extending beyond the clinic. All nurses believed they had a role to play in addressing sleep, but differed in their views about the possibility of becoming CBT-I interventionists and the training and support needed to do so.

Conclusion: HF nurses recognize the importance of insomnia and support the implementation of CBT-I. Implementation studies are needed to identify effective methods of increasing access to evidence based CBT-I in the HF clinic setting, including appropriate support and training for nurses with interest in CBT-I delivery.

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0405

HOW WELL DOES SEXUAL ACTIVITY IMPROVE SLEEP WHEN COMPARED WITH PHARMACOLOGIC SLEEP AIDS?

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Introduction: Insomnia is a common sleep disorder with negative impacts on psychological and physical health. Films and books for the general public have commonly suggested that sexual activity is followed by increased sleep drive. Our initial survey was done to assess the perceived impact of sex and orgasm on sleep in people with insomnia in comparison to the use of sleeping pills.

Methods: An 8-question survey was created with Qualtrics. The link to the survey was shared via social media, including Twitter. Explanation was given about the purpose of the survey. Ages under 18 were excluded from the study.

Results: 53 individuals completed the survey, 53% were female. The survey skewed to younger adults, 89% between 25-49 years of age. 75% of respondents reported that they slept better after sex/orgasm close to bedtime and the majority reported a moderate improvement in sleep on those nights. Medication was utilized to improve sleep by 66% of the individuals. In comparison to sex/orgasm, the majority of those surveyed felt that medication had similar or worse effect on their sleep (64%).

Conclusion: This was a preliminary survey of a general audience about the impacts of sex/orgasm on sleep and the comparison to medications. It appears that sex/orgasm had a positive impact on sleep in both males and females in the surveyed population and was used not infrequently to improve sleep. Although this survey demonstrated largely positive impact of

sex/orgasm on sleep, negative associations with sexual activity were not explored and people with these negative associations (such as those with sexual-related trauma) may not have been well represented. Limited research has been done about the relative impacts of sex and orgasm on the quality of sleep, however, this survey suggests that media depictions of falling asleep faster after sex may be accurate in the general population. Given the above findings, further thoughtful examination of the impact of sexual activity on sleep is warranted, recognizing that there are many in whom sexual activity prior to bedtime is a negative experience and may worsen sleep.

Support (if any):

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0406

IMPACT OF COMORBID INSOMNIA AND NOCTURIA ON SUBJECTS' LIVES AS ASSESSED THROUGH A CONCEPT ELICITATION STUDY

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Introduction: The lived experiences of individuals with insomnia and comorbid nocturia are not properly understood. This study explored the lived experiences of individuals with insomnia and comorbid nocturia to identify relevant concepts that could be reflected in patient-reported outcome (PRO) endpoints in clinical studies.

Methods: This was a cross-sectional, qualitative observational study. Data were collected from a sample of 10 adult subjects from the US suffering from insomnia disorder (DSM-5) and comorbid nocturia (≥ 2 nocturnal voids). Interviews were conducted using semi-structured guides, lasted 60–90 minutes, and assessed patient-relevant concepts of interest for their insomnia and nocturia. Institutional review board approval and web-based informed consent were obtained prior to the interviews.

Results: Overall, 10 participants were included, and the mean age was 61 years (SD=6). Most participants were female (8/10), White (9/10), and lived with a partner/spouse, family, or friends (8/10). Almost all participants experienced insomnia symptoms at least 5 nights per week (9/10), most often impacting their emotional (10/10), social (10/10), physical (9/10), cognitive (9/10), and work and productivity (6/10) functioning. Almost all participants reported that decreasing the impact of insomnia would be meaningful (8/10), most often mentioning improvements in physical impacts such as having more energy or feeling less exhausted (7/10). All participants experienced nocturia at least 6 nights per week (10/10), often impacting their emotional (7/10), social (6/10), physical (6/10), cognitive (4/10), and work and productivity (4/10) functioning. Participants reported that going to the bathroom less often (i.e., two times per night, once per night, or not at all; each 2/10) and being able to sleep through the night (2/10) would be meaningful improvements.

Conclusion: Individuals with insomnia and nocturia experience disrupted sleep patterns that impact their emotional, social, physical, cognitive, and work functioning. Feeling less tired, being able to sleep through the night, and getting up less often to use the bathroom would be meaningful to patients living with both conditions.

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0407

IMPACT OF LEMBOREXANT ON DAYTIME RATINGS OF SLEEPINESS/ALERTNESS IN SUBJECTS WITH INSOMNIA DISORDER AND BASELINE SLEEPINESS

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Introduction: Since the use of sleep-promoting drugs can also lead to residual morning sleepiness, it is important to determine if a new hypnotic is associated with such a carryover effect of treatment. To this end, an assessment of sleepiness/alertness was included in lemborexant (LEM) phase 3 studies. LEM is a competitive dual orexin receptor antagonist approved in several countries for the treatment of adults with insomnia. This post-hoc analysis of Study 304 (E2006-G000-304; NCT02783729) assessed the impact of LEM on morning sleepiness/alertness in subjects who reported at least mild/moderate morning sleepiness at baseline.

Methods: Study 304 was a randomized controlled study in adults ≥ 55 y with insomnia disorder (N=1006). Subjects received bedtime doses of placebo (PBO), LEM 5mg (LEM5), LEM 10mg (LEM10), or zolpidem tartrate extended release 6.25 mg (not reported here) for 1 month. A daily Sleep Diary assessed morning sleepiness, within 90 min of waketime, with the question “How alert/sleepy do you feel this morning?” rated from 1 (extremely sleepy) to 9 (extremely alert). Scores were averaged over 7-day periods for baseline (single-blind run-in) and first and last 7 days of treatment. Chi-square tests were used to compare the shift from sleepy (≤ 3) to more alert (> 3) between PBO and treatment groups. **Results:** At baseline, 59/203 (29.1%), 66/261 (25.3%), and 79/265 (29.8%) of the PBO, LEM5, and LEM10 subjects reported a score ≤ 3 , indicating at least mild/moderate morning sleepiness. At the end of 1 month of treatment, 37/57 (64.9%) of the PBO subjects rated themselves as less sleepy and more alert (> 3), compared with 50/64 (78.1%; $P=0.11$) LEM5- and 58/76 (76.3%; $P=0.15$) LEM10-treated subjects.

Conclusion: In this study, ~28% of subjects reported morning sleepiness at baseline. More subjects who reported sleepiness at baseline and received LEM reported improved morning alertness during the last week of treatment compared with PBO subjects. These data are concordant with previous findings of a lack of effect of LEM on tasks requiring alertness in the morning.

Support (if any): Eisai Inc.

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0408

INSOMNIA, HYPERSOMNIA, AND DEPRESSION IN BUPRENORPHINE TREATED OPIOID USE DISORDER SUBJECTS

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Introduction: Sleep disturbances and depression are highly prevalent in Opioid use disorder subjects treated with buprenorphine. However, the association between sleep disturbances such

as insomnia/hypersomnia and depression in the above patient population is not known. The aim of the study is to examine the association between sleep disturbances including insomnia and hypersomnia with depressive disorders in buprenorphine treated opioid use disorder (OUD) subjects.

Methods: We studied 92 OUD (38 $\pm$ 11.2y, 49% female, 9% minority) at the Recovery, Advocacy, Empowerment and Service program (RASE) and Internal Medicine clinics of Welspan (York, PA). Subjects completed the Patient Health Questionnaire-9 (PHQ-9), Insomnia Severity Index (ISI), Epworth sleepiness scale (ESS), and opioid craving scale (OCS). Depression was defined as a PHQ 9 score ≥ 10 , insomnia with an ISI score of > 15 and excessive daytime sleepiness (EDS) with an ESS score of > 10 . Binary logistic regression analysis evaluated the likelihood of OUD subjects having depression in relation to insomnia, excessive daytime sleepiness (EDS), opioid craving, duration of opioid use, duration since last use of any illegal substance, number of rehabilitation treatments and buprenorphine dosage.

Results: No differences between in OUD subjects with (n=47) and without (n=34) depression were observed in age, duration of opioid dependence, duration of buprenorphine treatment, number of rehabilitation treatments or time since last use of any illegal substance. Subjects with depression had significantly higher ISI (18.2 $\pm$ 4.2 versus 11.8 $\pm$ 6.6, $p < 0.01$), ESS (11.2 $\pm$ 4.7 versus 8.2 $\pm$ 4.1, $p < 0.01$) scores and a trend towards higher OCS score (3.2 $\pm$ 4.1 versus 1.9 $\pm$ 2.2, $p=0.056$) as compared to those without depression. The odds of depression associated with Insomnia and EDS were 8.5 (95%CI=2.3-31.2) and 4.4 (95%CI=1.1-17) times respectively in this patient population.

Conclusion: Insomnia and hypersomnia are highly associated with depression in buprenorphine treated OUDs patients. Insomnia and hypersomnia needs to be evaluated early and receive targeted treatment during early abstinence in order to prevent relapse in this patient population.

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0409

IS INSOMNIA WITH OBJECTIVE SHORT SLEEP DURATION RELATED TO INSUFFICIENT SLEEP DRIVE OR PHYSIOLOGICAL HYPERAROUSAL?

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Introduction: Insomnia with objective short sleep duration (OSSD) was found to be associated with higher risks of cardiometabolic disorders, and was therefore proposed to be a phenotype associated with higher physiological hyperarousal. Previous studies further reported that insomnia with OSSD had higher autonomic arousal as measured by heart rate variability (HRV) during sleep. Since sleep duration could be determined by the interplay of arousal and sleep drive and HRV during sleep could be influenced by sleep staging and quality, the present study examined the level of arousal and sleep drive prior to sleep with EEG power and HRV to further understand the phenotyping of insomnia.

Methods: Ninety-four insomnia patients participated in the study and went through one night of 8-hour PSG recording. They were divided, with a cut-off of PSG total sleep time of 6 hours, into two groups: an OSSD group (N=26; mean age=37.0

± 10.3 ; M:F=7:19; TST=286.21 $\pm$ 87.21 min) and an objective normal sleep duration (ONSD) group (N=68, mean age=32.95 $\pm$ 10.05, M:F=12: 56, TST=414.4 $\pm$ 28.9 min). Resting-state EEG and EKG were recorded for a 6-min period, 3-min eye-opened (EO) with fixation focus and 3 mins eye-closed (EC), prior to bedtime.

Results: T-tests showed no significant difference in HRV measures (SDNN, RMSD, LF, HF, LF/HF) between the two groups, but shorter R-R interval for OSSD group than ONSD group. Mann-Whitney tests for EEG power showed significantly lower theta power at F3, F4, C3, C4, and O2, and higher sigma power at F3, C3, C4, O1, and O2 during EC, as well as lower theta power at C3 and higher sigma power at O2 during EO for OSSD group in comparison to ONSD group.

Conclusion: The results partially support that insomnia with OSSD is associated with physiological hyperarousal as indicated by faster heart rate and higher high frequency EEG power prior to sleep. However, the lower EEG theta power prior to sleep suggest that lower homeostatic sleep drive may also play a role for the insomnia with short objective sleep duration.

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0410

LAVENDER ESSENTIAL OIL AND SLEEP HYGIENE AS THERAPEUTIC OPTIONS FOR INSOMNIAC POSTMENOPAUSAL WOMEN: A RANDOMIZED CLINICAL TRIAL

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Introduction: Menopausal transition and postmenopause often bring sleep complaints and insomnia, a common sleep disorder. In addition, women at this stage also experience vasomotor symptoms, which can compromise sleep maintenance and quality of life. This study aimed to observe the effect of an intervention with aromatherapy and sleep hygiene in the quality of life, self-related sleep pattern and hot flashes record in postmenopausal women with insomnia diagnosis.

Methods: This pilot study is a double-blind randomized clinical trial. Of the 135 women interested in participating in the study, 34 postmenopausal women met the inclusion criteria and completed the protocol. Volunteers were clinically diagnosed with insomnia and distributed in two groups: Aroma Group (Lavandula angustifolia essential oil) (n=17) and Placebo Group (sunflower oil) (n=17), both inhaled before bedtime for 29 days. The groups received sleep hygiene guidelines and were monitored weekly. To assess the effect of the intervention, the Menopause-Specific Quality-of-Life Questionnaire, intervention version (MENQOL-I), and Epworth Sleepiness Scale (ESS) were used. With data from the sleep diary, we evaluated sleep onset latency (SLO), total sleep time (TST) and sleep efficiency (SE) daily. Additionally, participants who complained of vasomotor symptoms were invited to fill out a hot flashes form, reporting the presence or absence of these symptoms, daily amount, and its intensity.

Results: The therapeutic approaches in this study benefited participants in both groups in almost all domains of quality of life and self-rated sleep patterns such as TST and SE. Particularly, the lavender essential oil intervention provided significant improvement in the overall quality of life score over time. No differences were observed considering the hot flashes record and sleepiness.

Conclusion: The aromatherapy intervention was effective in improving overall quality of life in the Aroma group. Furthermore, strategies such as sleep hygiene and a sleep diary helped participants to self-assess their sleep routine and improve it.

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0411

LONG-TERM EFFICACY OF LEMBorexant ON OBJECTIVE SLEEP MEASURES IN CLINICAL PRACTICE

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Introduction: In the treatment of insomnia, both subjective and objective evaluations are essential. The orexin receptor antagonist, lemborexant, has a favorable profile in terms of efficacy, acceptability, and tolerability for adults diagnosed with insomnia. To date, the long-term efficacy of lemborexant has been evaluated solely on a subjective basis, with no long-term objective measures under natural sleeping conditions. Therefore, a small, lightweight sleep electroencephalograph monitor was used to evaluate sleep objectively at home after 4 and 12 weeks of lemborexant treatment.

Methods: Adults and elderly subjects with insomnia disorder per DSM-5 were enrolled in an open-label, single-arm, single-center trial. Participants took lemborexant (5/10 mg) at bedtime for 12 weeks. In addition, they underwent a home-based sleep study at baseline and weeks 4 and 12. Sleep efficiency (SE), total sleep time (TST), latency to persistent sleep (LPS), and wake after sleep onset (WASO) were evaluated at home. Sleep disturbance (Pittsburgh sleep quality index: PSQI), sleepiness (Epworth sleepiness scale: ESS), and depressive symptoms (Beck depression index: BDI) were examined.

Results: 31 subjects completed the 4-week and 29 completed the 12-week assessments. Subjects showed significant improvements in objective SE at weeks 4 and 12 of treatment compared to untreated baseline. Objective TST tended to increase with the treatment at week 12. Mixed-effects linear analysis revealed that the poorer the sleep measures (SE, TST, LPS, and WASO)

were at baseline, the more these measures improved with lemborexant. Scores of PSQI, ESS, and BDI significantly decreased (improved) with lemborexant treatment compared to those at baseline.

Conclusion: The findings from the analyses demonstrate objective improvement of SE with lemborexant treatment across 12 weeks and support the previously reported benefit of lemborexant using polysomnography.

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0412

MULTIMETHOD REMOTE ASSESSMENT OF COGNITION AMONG OLDER ADULTS WITH INSOMNIA

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Introduction: Cognitive complaints are common among older adults with insomnia. However, previous research is inconsistent regarding the association between insomnia and objective cognitive function. The purpose of this study was to compare subjective and objective cognitive function between older adults with insomnia and healthy sleepers. We hypothesized that relative to healthy sleepers, older adults with insomnia would display diminished subjective and objective cognitive function as measured via multiple remote assessment methods.

Methods: Participants were recruited from an academic medical center through multiple pathways. Cognitive assessments were administered via several approaches. First, subjective cognitive function was assessed via the 5-item Alert Cognition subscale of the psychometrically derived Daytime Insomnia Symptoms Scale (DISS), completed via smartphone 4x/day throughout a two-week study period (i.e., 56 administrations over 14 days). Second, objective cognitive function was assessed via telephone using the Brief Test of Adult Cognition by Telephone (BTACT), which assesses memory, reasoning, verbal fluency, and executive function. Finally, the psychomotor vigilance task [PVT], Stroop test, and a task-switching exercise were administered remotely via participant's home desktop computer.

Results: Participants included 31 older adults who met DSM-V diagnostic criteria for insomnia disorder (67.5 [sd 6.6] years) and 33 older adults without sleep disorders (70.5 [sd 5.7] years). Large between-group differences were observed in the Alert Cognition subscale of the DISS (p-values < 0.0001); compared to healthy sleeper controls, participants with insomnia reported worsened forgetfulness, concentration, alertness, clear-headedness, and cognitive effort. No between-groups differences were observed in any domain of the BTACT or PVT. A numeric but not statistically significant between-groups difference was observed in overall response speed (e.g., Incongruent Response Time) on the Stroop test (p-values > 0.125).

Conclusion: Remote assessment of cognition is feasible among older adults with insomnia. Significant differences in subjective but not objective cognitive function, likely due to low statistical power, as cognitive deficits in insomnia tend to have small effect

sizes. Overall, findings highlight the importance of multimethod assessments of cognition in older adults with insomnia and need for large sample sizes when evaluating objective cognitive function.

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0413

NEUROTICISM INTERACTS WITH STRESSFUL EXPERIENCES DURING DEPLOYMENT TO PREDICT POST-DEPLOYMENT INSOMNIA

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Introduction: Negative affect traits, such as neuroticism, have been shown to be associated with greater risk for insomnia. These trait-based factors are theorized to increase stress reactivity, which can be a predisposing factor to insomnia. Military personnel represent a unique population that are subject to stressors as a nature of their occupations and may therefore be particularly vulnerable to the onset and persistence of insomnia. The present study examined prospective associations among trait-based emotional reactivity and neuroticism, exposure to stressful experiences during a combat deployment, and insomnia symptoms at 9-months post-deployment.

Methods: Data were obtained from the Army Study to Assess Risk and Resilience in Servicemembers Pre-Post Deployment Survey (PPDS). Soldiers included in these analyses (n = 1448) completed surveys prior to deployment to Afghanistan, immediately after deployment, and 9-month post-deployment. The survey included measures of insomnia symptoms, deployment-related stressors and trait-based personality measures. Logistic regression was used to examine the relationships among emotional reactivity, neuroticism and deployment stress with post-deployment insomnia.

Results: Higher trait-based neuroticism and greater exposure to deployment-related stressors were independently associated with greater risk of probable insomnia at 9-months post-deployment, but not trait-based emotional reactivity. However, there were significant interaction effects, such that among those with greater range of stressful events, neuroticism was associated with higher risk of post-deployment insomnia, while emotional reactivity was associated with lower risk.

Conclusion: A trait disposition for negative affect (i.e., neuroticism) may predispose individuals to chronic insomnia in the face of acute stressors. While neuroticism includes negative emotional reactivity, it also encompasses other characteristics (e.g., negative self-perception) that may be a stronger predictor of persistent insomnia symptoms. Service members with higher baseline neuroticism may benefit from pre-deployment skills trainings to better cope in the face of stressors and prevent/mitigate long-term problems.

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0414**PAIN IN YOUR DAY? GET SLEEP TREATMENT ANYWAY! THE BENEFITS OF BEHAVIORAL TREATMENTS FOR INSOMNIA DESPITE PAIN SYMPTOMS.**

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Introduction: Sleep-related problems and pain affect millions of U.S. adults. Sleep-focused interventions improve both sleep and pain-related outcomes. However, pain can be a barrier to insomnia care due to perceptions that insomnia treatment may not be as effective in the presence of ongoing pain. This study evaluated whether pain severity and pain interference in daily life moderate the effects of behavioral treatments for insomnia on sleep outcomes (e.g., insomnia symptoms, perceived sleep quality, sleep effort, daytime sleepiness).

Methods: Secondary data analysis was conducted on a sample of 149 women veterans with insomnia disorder who completed either Cognitive Behavior Therapy for insomnia (CBT-I) or Acceptance and Behavioral Changes to treat Insomnia (ABC-I) treatment, both of which showed overall benefit in treating insomnia in women veterans. In the original study, sleep outcomes (ISI, PSQI, GSES, ESS), pain factors (BPI), and other outcomes were measured at baseline, post-treatment, and at 3-months follow-up. Linear and quadratic mixed effects models with random intercepts (subject-level) were conducted to examine the influence of treatment phase, pain-related severity and interference, and their interaction on sleep outcomes.

Results: All models were statistically significant ($92.13 \leq X^2 \leq 519.55$). No significant interactions were present between treatment phase and pain severity or interference in relation to sleep outcomes. Across analyses, treatment phase, both from baseline to posttreatment ($-2.22 \leq b \leq -8.31$, $p < .001$) and from baseline to 3-month follow-up ($-2.67 \leq b \leq -8.17$, $p < .001$), illustrated significant improvement of sleep quality outcomes.

Conclusion: Neither pain severity nor pain interference had a significant impact on outcomes of behavioral treatments for insomnia in women veterans. Findings have clinical implications in that they support the encouragement of individuals with co-morbid chronic pain and insomnia symptoms to engage in non-pharmacological interventions for insomnia disorder. Future research could expand on this study by including pain-related interventions concurrent with behavioral interventions for insomnia disorder.

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0415**PREDICTORS OF TREATMENT RESPONSE AND REMISSION AFTER CBT-I AMONG ADOLESCENTS WITH INSOMNIA AND EVENINGNESS**

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Introduction: Despite the efficacy of cognitive behavioural therapy for insomnia (CBT-I) for treating youth insomnia, there remain individual differences in treatment outcomes. Previous studies found that demographic (e.g., age) and clinical features (e.g., depression, anxiety) could potentially affect treatment responses in adults but there has been limited research conducted in youth. This study aimed to identify potential predictors of treatment response and remission of insomnia following CBT-I in a sample of adolescents with insomnia and eveningness.

Methods: The sample consisted of 57 adolescents with insomnia with eveningness (Age: 20.21 ± 1.95 , 15-24, female: 56.14%) who had completed a 6-session group-based cognitive behavioural therapy (CBT-I) with ($n = 27$) or without bright light therapy ($n=30$). Assessments were conducted at baseline and one-week post-intervention. Insomnia Severity Index (ISI) was used to measure self-reported insomnia symptoms. Treatment response was defined as a reduction in ISI score ≥ 6 after treatment, and remission was defined as an ISI score < 9 at post-treatment. Backward stepwise logistic regression was conducted to explore baseline demographic and clinical factors (e.g., comorbid depression or anxiety, suicidality) that might contribute to treatment response and remission of insomnia.

Results: About 64.9% and 68.4% of the participants achieved treatment response and remission of insomnia, respectively. There was no significant difference in response (60.0% vs. 73.4%) and remission (63.3% vs. 74.1%) rates between participants with and without adjunctive light therapy. Treatment response was significantly predicted by lower suicidality ($p < .05$) and less eveningness ($p < .05$), while being male ($p = .09$) and having greater insomnia symptoms ($p = .06$) were associated with treatment response at a marginal significance. Participants with older age ($p < .05$) and greater insomnia

symptoms ($p < .05$) were more likely to achieve a remission. Moreover, greater anxiety symptoms ($p = .09$) and adjunctive bright light therapy ($p = .07$) predicted insomnia remission with a trend towards significance.

Conclusion: CBT-I is more effective in adolescents with less eveningness, elevated insomnia symptoms, and less suicidality. Future research should explore whether addressing these factors in the delivery of CBT-I could improve treatment outcomes in youths with insomnia.

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0416

PRELIMINARY STUDY OF THE EFFECTS OF CONTINUOUS THETA BURST STIMULATION OF THE DEFAULT MODE NETWORK ON SUBJECTIVE SLEEPINESS

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Introduction: Repetitive transcranial Magnetic Stimulation (rTMS) is a noninvasive intervention commonly used to treat clinical depression by modulating brain activity in specific regions. We investigated rTMS of the default mode network (DMN) as a potential treatment for insomnia. The DMN is associated with internally focused cognition and rumination. Therefore, we expected that modulation of this network would improve sleep. As reported elsewhere, this trial showed that active cTBS to the DMN improved polysomnographically (PSG) measured sleep. Here, we hypothesized that participants who were treated with active continuous theta burst stimulation (cTBS) rTMS over the DMN versus sham cTBS would report reduced subjective sleepiness following post-treatment sleep.

Methods: Twenty adults with clinical insomnia completed this study (Mage=26.90, SD=6.56). Participants completed two overnight visits; one where they received active cTBS treatment and one where they received sham TMS treatment. We analyzed the Karolinska Sleepiness Scale (KSS), which was administered six times throughout each visit. KSS 1-3 were administered prior to treatment and KSS 4-6 were post TMS treatment. We used a repeated measures ANOVA to analyze effects of TMS on reported daytime sleepiness.

Results: There was no main effect of condition on sleepiness score $F(1,18) = 1.165$, $p = 0.295$, $\eta^2 p = 0.061$. There was a significant interaction effect of condition and pre/post intervention on reported subjective sleepiness $F(1,18) = 3.079$, $p = 0.013$, $\eta^2 p = 0.146$, although follow-up analyses did not reveal significant differences. Nonetheless, there was a continuous negative trend toward reduced sleepiness for post TMS administration after overnight sleep in active cTBS ($M = 4.8$, $SD = 1.96$) compared to the sham cTBS session ($M = 5.2$, $SD = 1.91$) ($p = 0.366$).

Conclusion: As reported elsewhere, this trial of a single administration of cTBS showed improved PSG sleep. Here we saw that there was no significant change in subjective sleepiness

following a night of sleep with or without the trial of cTBS, but there was a nonsignificant trend toward declining sleepiness for the active cTBS group relative to the sham condition. This preliminary study is encouraging and suggests that further research into this approach is warranted.

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0417

PRE-SLEEP WAKEFULNESS IN PATIENTS WITH INSOMNIA: HEART RATE VARIABILITY DURING SLEEP ONSET

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Introduction: Pre-sleep stress or hyperarousal is a known key etiological component in insomnia disorder. However, physiological alterations during the sleep onset period are not well-understood. We aimed to characterize heart rate variability (HRV) in patients with insomnia during sleep onset.

Methods: Using data from the Sleep Heart Health Study at National Sleep Research Resource, we conducted a secondary analysis exploring HRV during the sleep onset period (defined as the time between lights-off and sleep onset) in patients with insomnia (IS group; $n = 68$) and comorbid obstructive sleep apnea (IS + OSA group; $n = 135$), compared with normal sleep controls (NSC group; $n = 122$). Overall group differences were tested using ANOVA. Post-hoc pairwise comparisons were conducted using the least significant difference (LSD) tests.

Results: During sleep onset, mean heart rates of the IS group (74.4 ± 15.0 beats/min) and IS+OSA group (72.6 ± 11.5 beats/min) were both significantly higher than the NSC group (69.7 ± 9.4 beats/min, $p = 0.007$ and $p = 0.044$ respectively). Both the IS and IS+OSA groups showed lower heart rate variability compared to the NSC group, with significant differences in both time and frequency domains of HRV analysis including SDNN ($p = 0.002$), RMSSD ($p = 0.035$), pNN20 ($p < 0.001$), pNN50 ($p = 0.008$), LnLF ($p < 0.001$), LnHF ($p < 0.001$). For all these measures, IS+OSA group had lower HRV compared to the IS group, although differences were not significant. When controlling for age, gender and BMI, and compared to the NSC group, IS group had significantly higher heart rates ($\beta = 4.8$, $p = 0.008$), and the IS+OSA group had significantly lower pNN20 ($\beta = -0.039$, $p = 0.002$), pNN50 ($\beta = -0.031$, $p = 0.017$) and LnHF ($\beta = 0.007$, $p = 0.007$).

Conclusion: Patients with insomnia had lower vagal activity during the sleep onset period, reflected in higher heart rates and lower heart rate variability. Such altered heart rate dynamics may serve as a physiological biomarker for insomnia during bedtime wakefulness, or as a potential tool to evaluate the efficacy of behavioral interventions which target bedtime stress.

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0418

RACIAL DISPARITIES IN PATIENT ENGAGEMENT AND TREATMENT OUTCOMES IN DIGITAL COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA.

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Introduction: Cognitive behavioral therapy for insomnia (CBTI) is gold standard for insomnia care. However, recent data suggest Black CBTI patients may complete fewer sessions and experience poorer outcomes relative to white CBTI patients. The present study examined whether racial disparities in CBTI engagement mediated group differences in treatment outcomes on insomnia symptoms.

Methods: We conducted a secondary analysis of pretreatment and posttreatment data from 569 Black and white patients with clinical insomnia symptoms (Insomnia Severity Index [ISI] ≥ 15) who were randomized to digital CBTI in a large-scale RCT. Study outcomes included number of sessions completed (≥ 4 sessions considered an adequate dose) and insomnia symptoms (ISI).

Results: Black CBTI patients completed fewer CBTI session than white patients ($M \pm SD$: 2.81 ± 2.36 vs 3.79 ± 2.45 ; $t(561) = 4.06$, $p < .001$). Consequently, Black patients were 1.53 times more likely than white patients to prematurely discontinue CBTI before receiving an adequate dose (premature discontinuation rates: 62.5% vs 40.7%, $X^2 = 19.28$, $p < .001$). A multivariate linear regression showed that Black patients reported higher ISI scores than white patients after CBTI ($b = 1.28$, $p = .009$) while controlling for pretreatment ISI ($p < .001$). However, race became non-significant in the multivariate model ($b = .55$, $p = .248$) when sessions completed was entered as a predictor ($b = -.60$, $p < .001$). The PRODLIN method estimated the indirect to be $\alpha\beta = 2.27$ with a 95% Confident Interval of 1.59 to 2.96, thereby supporting a significant mediation. We estimated that 55.5% of racial disparities in posttreatment ISI outcomes were mediated through group differences in number of sessions completed. Notably, posttreatment insomnia remission ($ISI \leq 9$) rates did not differ between Black and white patients (36.9% vs 39.6% remission, $p = .613$), whereas insomnia remission rates were nearly twice as high among CBTI patients who received an adequate dose relative to those who discontinued prematurely (46.7% vs 24.9% remission, $X^2 = 23.46$, $p < .001$).

Conclusion: Black patients reported greater insomnia symptoms after CBTI relative to white patients, but these racial disparities in insomnia outcomes were largely attributable to lower rates of CBTI engagement among them. No racial disparities in CBTI outcomes were observed among those who completed ≥ 4 sessions. Enhancing treatment engagement among Black patients may improve dCBTI efficacy in this group.

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0419

SENSITIVITY OF ORP TO CLASSIFY INDIVIDUALS WITH INSOMNIA BASED ON SUBJECTIVE COMPLAINTS

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Introduction: The diagnosis of insomnia is currently based on subjective complaints. Previous research has demonstrated limited benefits of polysomnography in improving diagnostic accuracy with no evident differences in sleep macro-architecture and traditional indices of sleep quality. In this study, we aimed to assess the ability of a novel index of sleep quality, the Odds Ratio Product (ORP), to correctly identify individuals with insomnia, based on subjective complaints.

Methods: We analyzed responses to a custom sleep survey from 510 participants (age 46.2 ± 12.4 ; 229 females). We entered 13 outcomes to a principal component analysis (PCA). These included age, body mass index (BMI), Epworth Sleepiness Scale (ESS) scores, sex, questions about snoring, subjective hours of sleep, satisfaction with own sleep, movement symptoms, problems falling asleep, staying asleep and waking up early. Based on the correlations between the original outcomes, the PCA extracted 3 factors that were interpreted as 3 different phenotypes: 1) insomnia (e.g., sleep initiation and maintenance complaints, satisfaction with sleep, lower subjective sleep duration); 2) OSA (e.g., bed partner snoring complaints, snoring self-awareness, sleepiness, respiratory complaints); 3) movement disorder (e.g., movements, female, lower age, higher BMI). We then computed the pre-test probability of insomnia (factor 1 scores $> 80\%$) and conducted a series of ROC analyses to assess specificity of PSG indices traditionally used to evaluate the presence of insomnia, and of ORP metrics.

Results: The AUC values assessing the ability of ORP metrics to predict 80% pre-test probability of insomnia were: ORPwake (0.592, 95% CI 0.499-0.685), ORPNREM (0.465, 95% CI 0.362-0.558), ORPREM (0.542, 95% CI 0.447-0.636), and ORPTRT (0.567, 95% CI 0.475-0.659). When looking at traditional indices like total sleep time (TST), wake after sleep onset (WASO), and number of awakenings, the AUC values were 0.471 (95% CI 0.385-0.556), 0.612 (95% CI 0.528-0.697) and 0.509 (95% CI 0.421-0.597), respectively.

Conclusion: WASO, ORPwake and ORPTRT have the highest sensitivity to detect insomnia in participants with $> 80\%$ pretest probability measured by subjective complaints. These analyses indicate the value of EEG metrics of sleep quality to correctly identify individuals with insomnia and the need to investigate both sleep and wake states.

Support (if any):

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0420

SLEEP ONSET MISPERCEPTION IN YOUTHS WITH INSOMNIA: CORRELATES AND IMPLICATIONS FOR TREATMENT

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Introduction: Individuals with insomnia often show subjective-objective sleep discrepancy, especially an overestimation of their sleep onset latency (SOL) while the factors associated with such discrepancy remained unclear. Whilst cognitive behavioral therapy for insomnia (CBT-I) has been recommended as the first-line treatment for insomnia, there has been limited research to investigate the effects of CBT-I on sleep onset perception in youths with insomnia. The present study aimed to identify potential variables related to sleep onset misperception and explore the effects of CBT-I on sleep onset misperception among youths with insomnia.

Methods: Sixty treatment-seeking youths with insomnia (mean: 19.74 ± 2.42 , female: 55%) were recruited to assess for their sleep and clinical characteristics using self-report questionnaires and 7-days sleep diary and actigraphy (T1). A subset of the sample (N=19) further completed an 8-week CBT-I programme and assessed at one-week post-treatment (T2) and 6-month follow-up (T3). Sleep misperception index was computed by subtracting actigraphy-measured SOL from sleep diary reported SOL, where a higher value indicates a higher degree of SOL overestimation. Demographic, clinical and sleep-related variables were compared between high versus low sleep onset misperception groups as divided by the mean of the sample. Changes in sleep onset misperception after CBT-I were analyzed using repeated measures ANOVA.

Results: High sleep onset misperception group demonstrated a significantly higher degree of anxiety symptoms ($t(28)=-3.92$, $p<.01$) and pre-sleep cognitive arousal ($t(28)=-0.49$, $p<.05$) as compared to low sleep onset misperception group. Participants who completed CBT-I showed a significant decrease in subjective-objective SOL discrepancy (T1=19.52, T2=6.96, T3=-1.37). A post-hoc pairwise comparison using the Bonferroni correction suggested a significant decrease in subjective-objective SOL discrepancy from T1 to T3 ($p<.05$). Significant improvement in pre-sleep cognitive arousal was found from T1 to T3 ($<.001$) and such an improvement was found to be significantly correlated with the reduction in sleep onset misperception ($r=0.16$, $p<.05$).

Conclusion: Sleep onset misperception is associated with anxiety symptoms and pre-sleep cognitive arousal in youths with insomnia. Preliminary evidence supports that CBT-I is effective in improving sleep onset misperception in youths with insomnia. Future research should explore the neurophysiological mechanism underlying sleep onset misperception and the changes of such a discrepancy upon intervention.

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0421

SYNCHRONOUS VIRTUAL COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA: PRELIMINARY RESULTS OF SLEEP PATTERN CHANGES AMONG CANCER SURVIVORS

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Introduction: For cancer survivors, insomnia is a frequent and distressing concern. Cognitive behavioral therapy for insomnia (CBT-I) is an effective treatment, yet in-person care can be difficult for cancer survivors to access for a variety of socioeconomic, medical and logistical reasons. In a pilot randomized clinical trial, four, weekly sessions of virtually-delivered, synchronous CBT-I were feasible, acceptable, and seemingly efficacious for reducing insomnia among cancer survivors (vs. an enhanced usual care control). The aim of this secondary analysis was to characterize daily patterns in sleep diary metrics during the intervention phase.

Methods: Adults who had completed treatment for any non-metastatic cancer and had chronic insomnia (DSM-5 criteria and Insomnia Severity Index score ≤ 15) and were randomized to receive CBT-I completed daily assessments of sleep quality (SQ), total sleep time (TST), time in bed (TIB), sleep efficiency (SE), sleep onset latency (SOL), and waking after sleep onset (WASO) for 21 days (i.e., from Session 1-4). Linear mixed models were used to compute trajectories of change for each sleep metric and -2 log likelihood, AIC, and BIC fit indices.

Results: Among 20 cancer survivors who received CBT-I (mean age 51.2 ± 17.1 years, 90% female), model fit indices indicated that across sleep metrics, linear growth models provided a better fit to the data than either quadratic or cubic growth models. Significant linear improvement was observed for SQ ($B = 0.02$, $t = 3.60$, $p < 0.001$), SE ($B = 0.16$, $t = 2.01$, $p = 0.046$), and SOL ($B = -0.41$, $t = -2.47$, $p = 0.01$), but not TIB, TST, or WASO ($ts < 1.12$, $ps > 0.26$).

Conclusion: Findings elucidate how sleep may be expected to change over the course CBT-I, in particular for the growing population of cancer survivors seeking virtual care for insomnia. The strengths, limitations, and potential modifications

to optimize the intervention across sleep metrics will be discussed.

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0422

THE RELATIONSHIP BETWEEN EEG SPECTRAL ANALYSIS AND PRE-SLEEP COGNITIVE AROUSAL IN INSOMNIA DISORDER

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Introduction: The hyperarousal model suggests that insomnia is characterized by increased cortical, cognitive, and physiological arousal. However, the relationship between these domains of arousal remains insufficiently studied. The aim of the current observational study was to investigate pre-sleep cognitive arousal, cortical arousal during the night, and the relationship between these domains.

Methods: 109 patients with insomnia disorder (ID) and 109 age- and gender matched healthy controls (GSC) were investigated on two sleep laboratory nights. As a measure of cortical arousal, EEG spectral power was analyzed during NREM and REM sleep. In addition, participants completed the Pre-Sleep Arousal Scale (PSAS), which consists of a subscale for cognitive arousal (PSAS-CA) and another subscale for self-reported somatic arousal (PSAS-SA). The relationship between the subscale scores and EEG spectral power was calculated by multivariate and univariate analyses of variance.

Results: The total sample consisted of 218 participants. ID patients had a mean age of 44.7 years (± 10.6 years) and GSC had a mean age of 44.4 years (± 12.6 years). Both groups consisted of 78 women and 31 men. During NREM and REM sleep, patients with ID showed significantly increased spectral power in the EEG gamma band (NREM: $p < .001$; REM: $p = .002$). In addition, patients with ID showed significantly increased scores on the PSAS-SA (ID: $M = 12.4$, $SD = 4.4$; GSC: $M = 10.7$, $SD = 3.3$; $t(216) = 3.34$, $p = .001$, $d = 0.45$) and the PSAS-CA (ID: $M = 18.3$, $SD = 7.2$; GSC: $M = 10.6$, $SD = 2.9$; $t(216) = 10.33$, $p < .001$, $d = 1.40$). The PSAS-CA score was significantly associated with increased NREM ($p = .001$) and REM gamma power ($p = .004$), whereas PSAS-SA was associated with significant decreases in NREM ($p < .001$) and REM gamma power ($p = .001$).

Conclusion: In line with our hypothesis, patients with ID showed increased cortical and cognitive arousal. Moreover, there was a relationship between pre-sleep cognitive arousal and high-frequency EEG activity during the night. This might suggest that the latter is caused (at least in part) by pre-sleep worry and rumination.

Support (if any):

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0423

THE ROLE OF FEAR OF SLEEP IN COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA AND COGNITIVE PROCESSING THERAPY

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Introduction: Fear of sleep (FoS) is linked to symptoms of PTSD. Additionally, cognitive behavioral therapy for insomnia (CBTi) can reduce FoS. Utilizing data from a randomized controlled trial of CBTi followed by Cognitive Processing Therapy for PTSD (CPT), this secondary data analysis sought to examine the relationship between FoS and PTSD symptoms, and how FoS is impacted by CBTi, in individuals exposed to interpersonal violence with PTSD. Additionally, we sought to extend the literature by examining whether FoS predicts the effect of subsequent CPT on PTSD severity or if CPT further reduces FoS.

Methods: A sample of 83 participants were randomly assigned to either receive sequential delivery of four weekly sessions of CBTi, which included modules to address FoS, followed by 12 weekly sessions of CPT (Group 1: CBTi+CPT) or receive four weekly phone check-ins (CTRL) followed by CPT (Group 2: CTRL+CPT). Participants were assessed at baseline (T1), after CBTi/CTRL (T2), and after CPT (T3). Relevant measures included the Fear of Sleep Inventory (FoSI) and Clinician Administered PTSD Scale (CAPS). Analyses included correlations, mean differences tests, and regression-based analyses.

Results: At T1 FoSI and CAPS were positively correlated ($r = 0.47$, $p < 0.001$). At T2 a significant reduction in FoSI scores was observed after CBTi/CTRL for Group 1 ($t = 4.81$, $p < 0.001$), but not Group 2, and a significant difference in FoSI scores between Group 1 and Group 2, all while controlling for baseline differences ($F(1, 80) = 3.99$, $p < 0.05$). Lastly, for the entire sample lower T2 FoSI scores predicted lower T3 CAPS scores ($B = 0.42$, $p < 0.01$) and FoS was not further reduced following CPT.

Conclusion: Results replicate previous work by demonstrating a positive relationship between FoS and PTSD severity. Additionally, FoSI was significantly reduced after CBTi. Lastly, lower levels of FoS predicted reduced PTSD symptoms following CPT, although CPT was not associated with significant reductions in FoS. Results highlight that CBTi that explicitly addresses FoS may reduce FoS, and findings also suggest that effectively reducing FoS prior to PTSD treatment may improve treatment outcomes.

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0424

**VISUALIZING INSOMNIA PHENOTYPES
USING DIMENSIONALITY REDUCTION
TECHNIQUES**

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Introduction: A large number of features can be extracted from a single hypnogram, such as stages durations, onsets, or transitions probabilities. Those numerous indicators can turn a collection of sleep records into a high dimension space. Dimensionality reduction techniques are then useful to reveal patterns in data. We used 3 dimensionality reduction techniques to visualize insomnia phenotypes from a dataset of insomnia and control sleep records: principal component analysis (PCA), t-distributed stochastic neighbor embedding (t-SNE) and uniform manifold approximation and projection (UMAP).

Methods: 519 sleep records have been included with the following diagnoses: 46 sleep onset insomnia, 83 sleep state misperception, 223 sleep maintenance insomnia, 117 sleep onset and maintenance insomnia and 50 controls (good sleep). We limited the feature extraction to the hypnogram as macrostructure constitute the primary source of information used for diagnosis in polysomnography. We used common macrostructure indicators such as wake after sleep onset (WASO), as well as more intricate features such as stages transitions probabilities. A first set of 54 features per hypnogram was computed. Those features were then projected in a 2 dimensional space using PCA, t-SNE and UMAP.

Results: Co-ranking matrix of the projections was computed for the 3 techniques (PCA: Kmax=103, Qlocal=0.38; tSNE: Kmax=20, Qlocal=0.44; UMAP: Kmax=160, Qlocal=0.44). UMAP was the technique that projected the hypnograms feature sets in the most meaningful way, by reflecting the individual diagnoses. Interestingly in the UMAP representation, group outliers, such as controls having nevertheless experienced nocturnal awakenings were projected next to similar insomnia subjects, which indicate a fine-grained capture of sleep quality at the individual level.

Conclusion: Dimensionality reduction and unsupervised techniques are promising methods when approaching high dimensionality spaces. A fine analysis of projected clusters could show subgroups in already known phenotypes. As literature showed robustness and applicability of those methods to larger datasets, dimensionality reduction of insomnia records could be improved by the addition of new features computed from hypnodensities generated by machine learning algorithms, or by spectral features extracted from polysomnographic signals.

Support (if any): None

Abstract citation ID: zsad077.0425

0425**A NOVEL ACCEPTANCE-BASED APPROACH FOR PAP ADHERENCE IN WOMEN VETERANS: IMPROVEMENTS IN MEASURES OF SLEEP QUALITY**

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Introduction: While positive airway pressure (PAP) therapy is the most efficacious and widely used treatment for sleep disordered breathing (SDB), the initial discomfort associated with PAP use and the poor sleep experienced by patients with SDB contribute to treatment non-adherence. Women with SDB report poorer sleep quality and have lower PAP adherence rates than men. Previous interventions to improve PAP adherence have rarely targeted women. Acceptance and Commitment Therapy (ACT) utilizes patient values and mindfulness techniques to promote sustained behavior change. An ACT-based approach, in combination with behavioral sleep improvement recommendations, may improve sleep quality and reduce barriers to PAP adherence.

Methods: We analyzed data from women veterans with SDB (mean age=53.2 years [range 26-80]; n=90) who participated in a clinical trial of interventions to improve sleep quality and PAP adherence. Participants were randomly assigned to a PAP educational control intervention or an ACT-based intervention, Acceptance and the Behavioral Changes to treat Sleep Apnea (ABC-SA). We measured: Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), and subjective and objective (actigraphy) sleep efficiency (SE), total sleep time (TST; minutes), and number of awakenings using sleep diary and actigraphy data, respectively. Using mixed-effects models, we examined changes in sleep quality measures at post-treatment and 3-month follow-up, as compared to baseline.

Results: Women assigned to the ABC-SA intervention reported significantly greater improvements on PSQI total score ($p < 0.001$), ISI total score ($p < 0.001$), diary SE ($p < 0.001$), and actigraphy SE ($p < 0.041$), and a decrease in actigraphy TST ($p < 0.013$) at post-treatment compared to women assigned to the control intervention. These observed changes for the ABC-SA intervention relative to the control intervention were maintained at 3-month follow-up ($p \leq 0.001-0.017$). No group differences were observed for diary TST or number of awakenings on diary or actigraphy at post-treatment ($p \geq 0.115$) or 3-month follow-up ($p \geq 0.248$).

Conclusion: An ACT-based approach improved sleep quality in women veterans with SDB, thereby reducing a known barrier to PAP adherence. Future studies should replicate current findings in other at-risk patient groups.

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0426**A REAL-WORLD EXPLORATION OF NON-CPAP THERAPIES FOR MILD OBSTRUCTIVE SLEEP APNEA IN THE VETERAN POPULATION**

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Introduction: Obstructive sleep apnea (OSA) is a common sleep disorder that is characterized by repetitive episodes of upper airway obstruction during sleep. Continuous positive airway pressure (CPAP) therapy is the gold standard treatment for OSA, but it is not always well-tolerated by patients. As a result, alternative treatment options for mild OSA have been investigated. This study aims to explore the usage of non-CPAP alternatives in the veteran population.

Methods: Informed consent was obtained from the participants. The desired target cohort included veterans newly diagnosed with mild obstructive sleep apnea (OSA) on home sleep study (HSAT) or primary snoring on polysomnography (PSG). Specifically, mild OSA was considered $pAHI < 15$, $pRDI < 15$, and $ODI < 15$ and primary snoring was diagnosed if snoring is a primary symptom on e-consult, technically adequate study and $pAHI < 5$ and $pRDI < 5$. During a one-week period, sleep medicine providers assigned to sleep study interpretations determined eligible veterans that met inclusion criteria. Veterans who had nocturnal hypoxemia (5% sleep time with saturation 88%), active home oxygen order, commercial driver, significant heart disease (e.g., heart failure, atrial fibrillation) or other sleep concern (parasomnia) were excluded from this study. Upon meeting selection criteria, eligible subjects were cosigned to nursing staff to discuss and choose non-CPAP treatment alternatives. A second point of contact was made 90 days later ($T=90$) to evaluate progress of the initial intervention. A standardized script was used for both communications.

Results: There were 62 subjects that were ultimately included in the study, of which 3 chose weight loss/lifestyle therapy, 5 chose positional therapy, 17 chose oral appliance, 19 chose nasal EPAP and 12 chose oral stimulator. Analysis of the treatment pathways is pending.

Conclusion: Data analysis is pending with conclusions to follow.

Support (if any):

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0427**AIRWAY PRESSURES DEFINE COLLAPSIBILITY OF SPECIFIC PHARYNGEAL SITES OF OBSTRUCTION DURING DRUG-INDUCED SLEEP ENDOSCOPY**

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Introduction: Obstructive sleep apnea (OSA) is characterized by repetitive episodes of pharyngeal obstruction at one or more collapse sites. Multilevel collapse is a negative predictive factor for PAP-alternative surgical treatments. Pharyngeal manometry during drug-induced sleep endoscopy (DISE) permits an objective evaluation of anatomical obstruction sites and mechanisms, and may play a role in patient selection for PAP alternative therapies. We hypothesized that patients with multilevel collapse

would have primary velopharyngeal collapse and secondary, downstream sites.

Methods: This prospective cohort of twenty consecutive patients with diagnosed OSA underwent DISE with nasal airflow monitoring and pharyngeal manometry. Two pressure catheters were placed at the (1) distal margin of the soft palate (Pus) and (2) retroepiglottic space (Pds). We sought to delineate site(s) of collapse by evaluating dissociations in airflow and air pressure during inspiratory flow limitation and/or complete obstruction. The primary site of collapse was defined by the initial segment at which inspiratory airflow and pressure dissociated (the critical pressure, Pcrit). Secondary site(s) were defined as the pressure at which the Pus and/or Pds signals subsequently dissociated (beyond the initial point of maximal flow).

Results: Twenty-one patients were evaluated of which signal quality and catheter placement in twenty were sufficient for analysis. Participants were elderly (58.3 ± 14.3 yrs, mean $\pm$ SD), overweight (BMI 28.7 ± 2 kg/m²), and had moderate-severe OSA (AHI 28.2 ± 14.2 events/hour). Six patients had a single site of collapse, of which one was naso-palatal (Pcrit -2.6 cmH₂O) and five were infra-palatal (mean Pcrit -1.3 cmH₂O). In the patients with multilevel collapse (N=14), all had primary naso-palatal collapse (mean Pcrit 0.17 ± 2.0 cmH₂O) and secondary infra-palatal sites of collapse (mean Pcrit -11.7 ± 5.8 cmH₂O). Pcrit differed between the primary and secondary site by 11.9 ± 6.5 cmH₂O ($p < 0.01$).

Conclusion: These findings suggest that single-site pharyngeal collapse is usually infra-palatal. In contrast, multilevel collapse is primarily due to velopharyngeal collapse with varying degrees of instability in downstream pharyngeal segments. When secondary infra-palatal sites readily collapse with minimal additional respiratory effort, laxity of the tongue and/or lateral walls may be strongly implicated in the pathogenesis of pharyngeal obstruction. Future studies can utilize pharyngomanometry to further target specific pharyngeal structures for OSA therapy.

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0428

AREA DEPRIVATION INDEX, SLEEP DISORDERED BREATHING AND INCIDENT MAJOR CARDIOVASCULAR EVENTS AND MORTALITY IN A LARGE COHORT

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Introduction: Epidemiological studies have shown a strong association between sleep disordered breathing (SDB) and increased incidence of cardiovascular morbidity and mortality, however, to date, the variation of SDB across the socioeconomic spectrum and how this variation is associated with major cardiovascular events (MACE) and mortality is unknown.

Methods: A retrospective cohort study was conducted using the Cleveland Clinic Sleep Laboratory Registry and included MACE-naïve adults who underwent polysomnography or home sleep apnea test. Area Deprivation Index (ADI), a biomarker of neighborhood socioeconomic disadvantage, was calculated by national rank, i.e. 25th, 50th and 75th percentiles; higher quartiles reflecting greater deprivation (ADI-Q1,2,3,4). ANOVA with

pairwise testing was used to compare variables across ADI quartiles. Composite of MACE included heart failure, stroke, atrial fibrillation and myocardial infarction or death. Cox proportional hazard regression models tested the association between ADI and SDB-measures of apnea hypopnea Index (AHI) and sleep-related hypoxia (total sleep time spent $< 90\%$ SaO₂, T90) with MACE. Covariates included demographics, medications, smoking status, Elixhauser Comorbidity Score, and comorbidities. Censoring was sleep study date or last encounter in the electronic medical record. Asterisk (*) indicates statistical significance after pairwise testing. Interaction testing used competing risk (Fine & Gray method).

Results: Of 72,443 patients, those living in ADI-Q4, compared to those living in ADI-Q1, were more likely to be younger ($*48.9 \pm 3.9$ vs 50.4 ± 14.2), female ($*59.9\%$ vs 40.1%), African American ($*49\%$ vs 4.9%), with lower AHI ($*13.5[5.4, 34.1]$ vs $15.1[6.2, 33.1]$) and lower degree of hypoxia (T90: $*2.9[0.40, 19.01]$ vs $4.4[0.50, 25.6]$). Model adjusted risk for MACE or death for those in ADI-Q4 was 79% greater than ADI-Q1 (HR=1.79, 95%CI: 1.51-2.12, $p < 0.0001$). Likewise, increased AHI severity and T90 above median were associated with 13% and 21% increased risk of MACE or death (HR=1.13, 95%CI: 1.07-1.19, $p < 0.0001$; HR=1.21, 95%CI: 1.51-1.27, $p < 0.001$) respectively. Interactions were observed between T90 and ADI with the risk of MACE ($p=0.0016$) or death ($p=0.0051$).

Conclusion: Living in areas of increasing socioeconomic deprivation confers an increased risk for MACE or death. Moreover, sleep-related hypoxia seems to modify this association. ADI appears to be useful to identify populations at risk for worse cardiovascular outcomes and to inform risk stratification for targeted interventions to decreased sleep-health disparities.

Support (if any):

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0429

ASSOCIATION BETWEEN HEALTHCARE COSTS AND CONTINUOUS POSITIVE AIRWAY PRESSURE ADHERENCE FOR TREATMENT OF OBSTRUCTIVE SLEEP APNEA

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Introduction: The impact of positive airway pressure (PAP) therapy on healthcare cost among patients with obstructive sleep apnea (OSA) requires further exploration. This study evaluated the associations between PAP adherence and cost in a large integrated healthcare system.

Methods: The study included adult patients with OSA (apnea-hypopnea index (AHI) ≥ 5) with available PAP therapy data between 1/1/2015 to 8/31/2019 from Kaiser Permanente Southern California. We followed the identified patients from the date of highest AHI before PAP use (index) up to 2 years. Each patient had PAP usage and cost organized into 6-month intervals, and mean hours/night and cost was calculated for each interval. Patients were stratified into the following adherence groups: (a) high adherence (≥ 4 hours/night consistently across all intervals); (b) moderate adherence (2–3.9 hours/night or ≥ 4 hours/night in some but not all intervals); (c) low adherence (< 2 hours/night). Healthcare costs (2020 US dollars) were derived

by assigning costs from federal fee schedules to healthcare utilization extracted from electronic health records. The 6-month mean healthcare costs associated with PAP adherence were estimated using generalized linear models adjusting for patient demographics, comorbidities, Medicaid coverage, prior healthcare cost, and AHI. Stratified analyses based on age (< 65, ≥65 years) and AHI (< 15, ≥15) were conducted.

Results: A total of 25,700 patients (63.3% male; 41.6% with AHI ≥30) were included in the study. Among those, 53.2% (n=13,684) categorized as having low PAP adherence, 24.2% (n=6221) as moderate adherence, and 22.5% (n=5795) as high adherence. High adherence was associated with the lowest average multivariable adjusted 6-month healthcare cost (\$3,586, 95% CI: \$3,428, \$3,745) compared with moderate (\$4,035, 95% CI: \$3,859, \$4,211) and low (\$4,232, 95% CI \$4,110, \$4,355) adherence. The cost differences between “high vs low” and “moderate vs low” adherence were \$646 (p< 0.001) and \$197 (p=0.050), respectively. The cost differences between “high vs low” adherence were \$999 (p< 0.001) for those with ≥65 years and \$657 (p< 0.001) for those with AHI ≥15.

Conclusion: Better PAP adherence was associated with significantly lower healthcare costs in patients with OSA although further understanding of the relationship is needed.

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0430

CENTRAL SLEEP APNEA AND INCIDENT ATRIAL FIBRILLATION IN A SLEEP DISORDERS CLINIC

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Introduction: Given conflicting evidence in the literature, we sought to evaluate the relative importance of central sleep apnea (CSA) and obstructive sleep apnea (OSA) on incident atrial fibrillation (AF) risk in a cohort of patients referred for sleep evaluation.

Methods: We reviewed the medical records of patients without AF at baseline who underwent in-lab diagnostic polysomnography (PSG) at six sleep laboratories within the University of Pittsburgh Medical Center (UPMC) between 2004 and 2018. Baseline characteristics including apnea hypopnea index (AHI), central apnea index (CAI), and obstructive apnea index (OAI) were extracted from the electronic health record. Among those with AHI≥15, patients were categorized as CSA if CAI≥5 and CAI>OAI or OSA if OAI≥5 and OAI>CAI. Patients with AHI< 15 were included as the reference group. Incident AF was identified based on AF as a primary or secondary diagnosis on either inpatient or outpatient UPMC visits.

Results: We identified 24,199 patients (425 CSA, 7559 OSA, 16,215 no sleep-disordered breathing [reference]) for analysis

who had a mean age of 49, mean body mass index (BMI) 34, and 48% male. The incidence rates for AF ranged from 1.07 per 100 person-years in the reference group to 1.91 and 2.60 in the OSA and CSA groups (p< 0.01). Using Cox proportional hazards models, the hazard ratio for incident AF in the OSA group compared to reference was 1.78 (95% CI [1.63-1.94], p< 0.01) and in the CSA group was 2.48 (95% CI [1.92-3.21], p< 0.01). After adjusting for age, sex, race, BMI, and baseline diagnoses of diabetes, heart failure, prior heart attack, and prior stroke, OSA was no longer associated with incident AF risk (HR=1.01, 95% CI [0.92-1.12], p=0.76). However, a potentially important association between CSA and incident AF persisted (HR=1.28, 95% CI [0.99-1.67], p=0.06).

Conclusion: We found that CSA was associated with a 28% increased rate of incident AF independent of traditional risk factors, which was nearly statistically significant. This suggests CSA may be a risk factor for AF. In contrast, OSA was a risk marker but not independent risk factor for AF.

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0431

DIFFERENT PHYSIOLOGICAL CHARACTERISTICS OF OBSTRUCTIVE SLEEP APNEA SYMPTOM SUBTYPES ACROSS INTERNATIONAL SLEEP CENTERS

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Introduction: Obstructive Sleep Apnea (OSA) is a widespread and heterogeneous sleep disorder. Studies have identified reproducible subtypes of OSA based on patient-reported symptoms that have different cardiovascular outcomes. Prior data showed similar apnea-hypopnea index (AHI) across subtypes; however, other physiological characteristics have not been comprehensively compared among these subtypes.

Methods: 1,285 participants from the Sleep Apnea Global Interdisciplinary Consortium (SAGIC) with moderate-severe OSA (AHI≥15) were included. Differences in traditional and novel physiological traits were compared among the Disturbed Sleep (n=183 [14.2%]), Minimally Symptomatic (n=581 [45.2%]), and Excessively Sleepy (n=521 [40.5%]) subtypes using analysis of covariance (ANCOVA) adjusted for age, sex, BMI and race/ethnicity. Measures included AHI and other respiratory event indices, hypoxic burden, oxygen characteristics, sleep/wake amounts, electroencephalogram (EEG) spectral characteristics, including metrics related to the odds ratio product (ORP; a validated index of sleep depth ranging from 0.0 [deep sleep] to 2.5 [full wakefulness]), arousal intensity, and heart rate response to arousal.

Results: Compared to other subtypes, the Disturbed Sleep subtype demonstrated increased wakefulness (more wake time [p< 0.001] and wake after sleep onset [p=0.001]), higher beta frequency EEG power (14.33-20.0 Hz [p=0.025] and 20.33-35.0 Hz [p=0.004]), and less deep sleep (higher average [p=0.001] and NREM-specific [p=0.044] ORP, less time with ORP from

0.50-0.75 [$p=0.004$] and 0.75-1.00 [$p=0.015$], and more time from 2.20-2.25 [$p=0.017$] and 2.25-2.50 [$p=0.0005$]). The Excessively Sleepy subtype had more severe hypoxemia, including greater hypoxic burden ($p=0.002$) and lower average SpO₂ ($p=0.002$) and minimum SpO₂ ($p=0.0002$) compared to other subtypes.

Conclusion: Differences in physiological characteristics, including ORP-related traits, were observed among symptom subtypes. Results suggest that characteristics indicative of increased wakefulness may distinguish those with the Disturbed Sleep subtype, whereas more severe hypoxemia may characterize the Excessively Sleepy subtype. Future investigations into underlying molecular causes of symptom subtypes, particularly the Excessively Sleepy, are warranted given evidence of associations with outcomes such as cardiovascular disease.

Support (if any): SAGIC Investigators (Ayas N, Chen NH, Cistulli P, de Chazal P, Gislason TG, Han F, Hirsch-Allen AJ, Keenan BT, Li QY, Magalang UJ, Maislin G, Mazzotti DR, McArdle N, Mindel J, Pack AI, Penzel T, Schwab RJ, Singh B, Sutherland K); NIH P01 HL094307

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0432

ESTIMATING THE PREVALENCE OF OBESITY HYPOVENTILATION SYNDROME IN A RURAL APPALACHIAN INPATIENT COHORT

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Introduction: Patients with Obstructive Sleep Apnea (OSA) and concomitant Obesity Hypoventilation Syndrome (OHS) have been shown to have excess morbidity and mortality and higher healthcare expenditure when compared with patients with OSA only. Despite this, OHS is typically underdiagnosed and untreated. These effects may be more pronounced in rural Appalachian patients in whom rates of obesity, cardiovascular disease, metabolic disease, smoking, and COPD exceed the national average, yet poverty and challenging geography undermine access to healthcare.

Methods: Eligible patients from Sept 2019-Jan 2022 were evaluated for sleep disordered breathing under our hospital sleep medicine program. These patients were screened using high-resolution pulse oximetry, or a portable Type III sleep testing device, or both. Their data was recorded onto our program registry and retrospectively analyzed.

Results: Of 1676 hospitalized patients evaluated through our hospital sleep medicine program, we determined that 1345 (80.2%) of patients had a BMI ≥ 30 kg/m². Of these patients, 823 (49.1%) had an arterial or venous blood gas collected during screening. Excluding patients with other potential causes for hypercapnia, 178 (10.6%) met criteria for OHS. 119 (66.8% of this subgroup) met criteria for OSA/OHS, while 33% did not have OSA (AHI/ODI < 5). Patients with OSA/OHS overlap in our cohort typically had mild OSA.

Conclusion: When compared estimates in urban populations, our cohort is underrepresented. As such, many more patients with potential OHS and OSA/OHS overlap are discharged

home without any treatment or plan for follow-up. One possible solution is suggested by the fact that only 49.1% of our initial cohort had an arterial or venous blood gas (ABG/VBG) collected during the admission. We recommend additional screening with serum bicarbonate and subsequent blood gases as part of an inpatient screening program for OSA/OHS. Early identification of these patients may facilitate early treatment while in-hospital and help reduce health disparity.

Support (if any):

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0433

HOME SLEEP APNEA TESTING IN PATIENTS WITH A LVAD: IS IT FEASIBLE?

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Introduction: Sleep related breathing disorders, including central sleep apnea (CSA), are frequent in patients with heart failure however, only limited data is known about the effect of left ventricular assist device (LVAD) placement on OSA and even less about the accuracy of home sleep apnea testing in this population (HSAT). Performing the gold standard polysomnography (PSG) is challenging in this cohort due to logistics, especially during the COVID-19 pandemic. Extending HSAT to the LVAD population would be beneficial, yet initial tests with the WatchPat® were deemed inconclusive. We decided to evaluate the validity of NOX-T3 device for HSAT compared to PSG.

Methods: This was a single center prospective, observational study that included LVAD patients who screened positive on the STOP-BANG questionnaire. A sleep study was indicated based on consultation with a sleep physician and a standard PSG was ordered. During the PSG, the NOX-T3 was also applied with the results analyzed and compared after test completion.

Results: In this preliminary analysis, 4 patients (3 male, 1 female) with a LVAD completed a PSG along with the NOX-T3. The overall severity of sleep apnea indicated by apnea hypopnea index during the PSG and the respiratory event index during the NOX-T3 were similar in this small cohort. In 2 of the 4 patients, the oximetry finding (minutes with oxygen saturations at or below 88%) were also similar during both the PSG and the NOX-T3.

Conclusion: Based on this preliminary analysis, data obtained with the NOX-T3 system were valid and compared well to the standard of care PSG in patients with a LVAD. We plan to enroll at least 10 patients in this ongoing trial, further studies will be needed to validate these results. Performing HSAT with the NOX-T3 in this unique population if PSG is not feasible would be of significant value given the morbidity of sleep apnea in this population.

Support (if any):

Abstract citation ID: zsad077.0434

0434**LONG-TERM POSITIVE AIRWAY PRESSURE USAGE DISPARITIES IN BLACK OR HISPANIC OF ANY RACE ADULTS WITH OSA**

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Introduction: Black or African American and Hispanic of any race (B/H) adults are disproportionately affected by obstructive sleep apnea (OSA). Positive Airway Pressure (PAP) treatment may reduce disparities, but short-term PAP outcomes are worse among under-represented minority (URM) adults compared to other, mainly White, adults. No studies have examined if adherence disparities persist/worsen long-term. We evaluated disparities in PAP usage between B/H adults and other race/ethnicities.

Methods: We defined a clinical cohort of adults with moderate-severe OSA (apnea-hypopnea index [AHI] ≥ 15 events/h) that underwent diagnostic sleep studies and initiated PAP between 01/2015-03/2018. Logistic regression was used to examine differences in the likelihood of still using PAP or meeting adherence threshold of ≥ 4 hours/night at 18-24 months. We performed mixed model for repeated measures to examine differences in h/night of PAP use over two years. Analyses were controlled for age, sex, BMI, AHI, and 3-month PAP usage to understand whether disparities emerged independent of short-term differences.

Results: Analyses included 1,518 individuals (694 [45.7%] B/H) with PAP usage at 3 months, who were middle-aged (53.4 ± 14.1 years-old), majority men (64.4%), obese (38.2 ± 9.8 kg/m²) and had severe OSA (46.6 ± 30.2 events/h). B/H adults had 70% higher odds (OR [95% CI] = 1.70 [1.33-2.17]) of no longer using PAP 18-24 months after initiation. B/H adults using PAP had ~ 2 hours/night less usage than other race/ethnicities at 18-24 months (2.72 [2.49-2.97] vs. 4.52 [4.31-4.73] hours/night; $p < 0.0001$). This difference was attenuated but remained significant after accounting for 3-month usage (mean [95% CI] difference = -0.64 [-0.92, -0.37] hours/night). B/H adults using PAP were also 3-times more likely to be non-adherent at 18-24 months (OR [95% CI] = 3.00 [2.28-2.95]), and remained 2-times more likely to be non-adherent controlling for 3-month usage (2.14 [1.56-2.92]).

Conclusion: At 18-24 months, Black or Hispanic of any race adults with moderate-severe OSA were less likely to use PAP, had less usage when still using PAP, and were less likely to achieve adherence thresholds. Long-term PAP disparities exist, even after accounting for short-term differences. Promoting longer-term PAP adherence for URM is a priority to reduce these disparities and address healthcare inequities.

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0435**MACHINE-LEARNED COMBINATION OF VENTILATORY, HYPOXIC, AND AROUSAL BURDENS CLASSIFIES DAYTIME SLEEPINESS BETTER THAN AHI**

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Introduction: The apnea-hypopnea index (AHI), the current severity metric used clinically for diagnosing obstructive sleep apnea (OSA), does not correlate well to daytime sleepiness measured via the Epworth Sleepiness Scale (ESS). Here, we assessed whether a machine-learned combination of possibly independent metrics across ventilatory/hypoxic/arousal domains would be better associated with ESS than the AHI using data from 3 large cohorts.

Methods: Polysomnography data were analyzed from The Sleep Heart Health Study (SHHS), The Multi-Ethnic Study of Atherosclerosis (MESA), and The Osteoporotic Fractures in Men (MrOS) Study. A total of $N=6618$ (39.9% female; age 68.7 ± 6.6) subjects had valid data (ESS and good quality airflow/EEG/SpO₂). Ventilatory burden was evaluated using a derived flow signal that utilized the sum of thoracic and abdominal effort signals for SHHS and was evaluated using the Nasal Cannula/Pressure Transducer signal for the MrOS and MESA data. Hypoxic burden was calculated as the area between the baseline and the SpO₂ trace for any episode with $\geq 3\%$ desaturation. Arousal burden was defined as the manually scored arousal index (number/hr.). Based on a cut-off of ESS (ESS ≥ 10), sleepiness was coded present or absent and was the primary outcome. Data were analyzed in two ways: using all 3 cohorts as train (70%) and test (30%), and by permutations and combinations of the 3 cohorts (70/30 split; e.g., SHHS for training, MESA and MrOS for test). Model performance metrics were the area under the receiver operating characteristic curve (AUROC) and %accuracy. For comparison, a logistic regression model using AHI3a (3% desaturation and/or EEG arousal) was fit.

Results: The logistic regression model (AHI3a) classified sleepiness with an AUROC of 0.51 ± 0.07 . The random forest model trained on 70% of all 3 cohorts achieved the highest AUROC of 0.88 ± 0.07 (mean accuracy of $85.1 \pm 2.13\%$), whereas the permutations and combinations of the 3 datasets resulted in an average AUROC of 0.63 ± 0.12 (mean accuracy of $76.4 \pm 6.57\%$).

Conclusion: The machine-learned combination of ventilatory/hypoxic/arousal burdens classifies daytime sleepiness in OSA better than AHI3a across data from 3 large cohorts. These results suggest that OSA severity measured using machine-learned combination of ventilatory/hypoxic/arousal burdens better explains the variability in daytime sleepiness.

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0436

OBSTRUCTIVE SLEEP APNEA (OSA) PATIENT JOURNEY: RETROSPECTIVE ANALYSIS OF REAL-WORLD DATAEmerson Wickwire¹, Xuan Zhang², Sibyl Munson², Adam Benjafield³, Mojgan Payombar⁴, Susheel Patil⁵¹ University of Maryland School of Medicine, ² Boston Strategic Partners, ³ ResMed Science Centre, ⁴ Primasun, ⁵ University Hospitals of Cleveland

Introduction: OSA affects about 30% of US adults and up to 90% remain undiagnosed and untreated. This study aimed to characterize the OSA patient journey by identifying the most common OSA care pathways in the U.S. We also sought to compare time from diagnosis to treatment initiation between groups.

Methods: Data was extracted from a national administrative claims database (01/01/2016–02/28/2020). Inclusion criteria included age ≥ 18 years and 12 months continuous enrollment before/after the first OSA diagnosis (index date). OSA was defined as ICD-10 diagnosis preceded by HSAT, in-lab PSG, and/or split-night PSG within the prior 12 months. Exclusion criteria included prior OSA diagnosis/treatment or central sleep apnea. Patient pathway, demographics (at time of OSA diagnosis), timeframes, and comorbidities were assessed. Associations between sex, region, payer, and median patient journey times were investigated using generalized linear models adjusted for baseline characteristics.

Results: A total of 86,827 OSA patients (45.1% female; median age, 50 ± 11.8) were identified, of which 60.8% initiated PAP therapy, 1.5% received an oral appliance, and 37.6% initiated neither treatment within the year following diagnosis. For patients initiating PAP, the most common care pathways identified for patients, and their median time to treatment initiation were HSAT-only (23.4%, 35 days), PSG+titration (22.9%, 58 days), split-night titration (16.8%, 28 days), PSG-only (11.2%, 37 days), HSAT+HSAT (6.9%, 37 days), titration+titration (3.9%, 31 days) and HSAT+titration (3.5%, 75 days). Relative to patients in PSG-only, individuals in HSAT-only were more likely to initiate PAP (56.1% versus 33.6% initiation). Longer timeframes from sleep test to PAP initiation were observed for patients with commercial insurance versus Supplemental Medicare (OR: 95% CI, 1.10: 1.07–1.14) and females (1.05: 1.04–1.06). There were significant differences in patient timeframes according to region ($p < 0.00001$). Notable patterns of differences in journey time and PAP initiation were observed based on patient Metropolitan Statistical Area (MSA) diversity and MSA median household income levels, when combined.

Conclusion: This is the first national analysis to characterize common OSA treatment pathways. Time to treatment initiation varied widely between OSA care pathways. Patient sex, region, payer, and household income were associated with time to treatment initiation.

Support (if any): Primasun

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0437

OBSTRUCTIVE SLEEP APNEA SYMPTOM SUBTYPES AND HYPOXIC BURDEN INDEPENDENTLY PREDICT DISTINCT CARDIOVASCULAR OUTCOMESDiego Mazzotti¹, Ulysses Magalang², Brendan Keenan³, Jesse Mindel², Magdy Younes⁴, Thomas Penzel⁵, Allan Pack³, Philip de Chazal⁶¹ University of Kansas Medical Center, ² The Ohio State University, ³ University of Pennsylvania, ⁴ University of Manitoba, ⁵ Sleep Medicine Center, Charité-Universitätsmedizin, Berlin, Germany, ⁶ Charles Perkin Centre, School of Biomedical Engineering, University of Sydney

Introduction: Studies on heterogeneity of obstructive sleep apnea (OSA) have identified clinically relevant symptom-based subtypes and novel OSA-specific nocturnal hypoxemia measures. Evidence suggests that moderate-severe OSA patients with the excessively sleepy subtype have increased risk of incident major adverse cardiovascular events (MACE; composite of coronary heart disease, heart failure, stroke, or cardiovascular mortality) and that OSA-specific hypoxic burden (HB) is associated with increased risk of cardiovascular disease (CVD) mortality. However, no study has comprehensively examined their combined impact. This study provides a systematic assessment of the individual and combined contribution of these factors on incident CVD risk, addressing an important gap in evidence.

Methods: Participants from the Sleep Heart Health Study with high-quality oxygen saturation, OSA severity quantified by apnea-hypopnea index (AHI), and symptom data were included. Latent class analysis on 14 symptoms was used to classify participants with moderate-severe OSA ($AHI \geq 15$) into subtypes. HB was calculated from respiratory event-related hypoxia and sleep time. Cox proportional hazards models were used to assess the relative contributions of OSA symptom subtypes and HB (natural log transformed) on risk for CVD mortality and MACE, adjusted for demographic and CVD risk factors. Analyses were performed in both CVD-free participants and all participants (adjusted for CVD at baseline).

Results: A total of 5,027 participants were analyzed, with median follow-up of 11.6 years (CVD mortality) and 11.3 years (MACE). HB was independently associated with CVD mortality in all participants ($HR[95\% CI] = 1.44 [1.06-1.97]$; $p = 0.021$) and CVD-free participants ($1.62 [1.12-2.35]$; $p = 0.010$) controlling for symptom subtype. Conversely, symptom subtypes were independently associated with MACE incidence among CVD-free participants, controlling for HB, with the excessively sleepy participants having nearly two-fold higher risk ($HR[95\% CI] = 1.98 [1.26-3.10]$; $p = 0.003$) compared to those without OSA.

Conclusion: OSA symptom subtypes and HB are independently associated with distinct CVD-related endpoints. Higher HB was associated with cardiovascular mortality, controlling for symptom subtype. The excessively sleepy subtype was at higher risk of new MACE, controlling for HB. Thus, both factors are important for understanding OSA-related CVD risk.

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0438

OBSTRUCTIVE SLEEP APNOEA IN PATIENTS WITH STROKE VERSES THOSE WITH REFRACTORY HYPERTENSION SEARCH FOR COMMON PATHOGENIC MECHANISM.

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Introduction: Obstructive sleep apnea [OSA] is a risk factor for stroke and refractory hypertension [RH]. OSA causes disrupted sleep, intermittent hypoxia, and hypoxia-induced systemic inflammation and sympathetic activation are potential pathogenic mechanisms for the first ever stroke and refractory hypertension. The aim of the present study was to evaluate sleep quality among OSA among patients with first ever stroke, as compared to RH and to assess markers of sympathetic activation and systemic inflammation in patients with either stroke or RH.

Methods: All patients with stroke and RH were recruited from the Departments of Neurology and Cardiology, respectively at the All India Institute of Medical Sciences, New Delhi. All patients were interviewed for demographic details, clinical history and were scheduled for polysomnography. Fasting blood samples were collected during morning hours, to estimate biochemical markers [Norepinephrine, CRP, TNF- α , VEGF and IL6]. CRP, TNF- α , and IL-6], measured by the chemiluminescence method. Nor-adrenaline and VEGF were measured using ELISA techniques.

Results: A total of 114 stroke patients and 56 refractory hypertension patients were included. The prevalence of OSA among stroke and RH patients was found to be 86.85 and 81% respectively. The mean number of wake after sleep onset periods (WASOs) [45 $\pm$ 19.22 vs 29.8 $\pm$ 11.14, $p < 0.01$] was significantly higher in patients with stroke. REM AHI [240.04 $\pm$ 24.65 vs 33.20 $\pm$ 22.35, $p < 0.01$] was significantly higher in patients with RH. CRP and VEGF values were higher than normal, in both groups. The median value of early morning serum nor-adrenaline was higher in the RH group [407 (66.6-1000) vs 515 (240-1250), $p = 0.05$].

Conclusion: OSA is highly prevalent among the patients in both groups. Systemic inflammation is a common pathogenic mechanism linking OSA with RH and stroke, whereas early morning sympathetic activation appears significantly important in the pathogenesis of refractory hypertension.

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0439

PATIENT-REPORTED EXPERIENCE WITH HYPOGLOSSAL NERVE STIMULATION FOR OBSTRUCTIVE SLEEP APNEA – INFLUENCE OF SYMPTOM IMPROVEMENTS

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Introduction: Hypoglossal Nerve Stimulation (HNS) is routinely used as an alternative treatment for patients with obstructive sleep apnea (OSA). Significant and clinically relevant improvements in disease severity and OSA symptoms such as daytime sleepiness as well as overall quality of life have been reported in randomized-controlled trials and large real-world cohort studies. However, so far little data exists on patient-relevant experience with the treatment.

Methods: A structured survey with 22 questions was constructed using five-level Likert scales (1 = no agreement, 5 = complete agreement) to evaluate patient experience with HNS in the dimensions "Overall experience with therapy", "Experience with treatment process" and "Side effects". Additional data was collected on current symptom status and OSA disease history.

Results: 45 patients from Germany that received a breathing-synchronized HNS system were enrolled (mean age 57.8 years, 78% male). Two-thirds of participants had an OSA history of 5 years or longer (67%). Of all patients, 76% had normalized OSA symptoms at time of the study (ESS: 6.4 $\pm$ 5.0) and 97.6% reporting every night use of stimulation therapy. Patients with normalized daytime sleepiness, reported significantly more positive experience across all major domains investigated, compared to patients with residual daytime sleepiness (ESS $\leq$ 10 versus ESS $>$ 10). HNS therapy was well tolerated in all patients, though patients with higher ESS values reported significantly less improvements of sleep quality and more often waking up from therapy. Only 2.2% of participants though had side effects that made them reduce or even discontinue stimulation therapy.

Conclusion: Overall patient-reported experience with HNS therapy is positive and high satisfaction with the treatment process was observed. Subjective experience is influenced by residual daytime sleepiness under stimulation. Side effects occur, but rarely impact subjective therapy use. Additional studies are warranted to confirm the findings from this evaluation in larger cohorts.

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0440

PERIPHERAL ARTERIAL TONOMETRY-BASED MEASURES OF OBSTRUCTIVE SLEEP APNEA IN BLACK, MEXICAN AMERICAN AND NON-HISPANIC WHITE ADULTS

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Introduction: Racial/ethnic differences may exist in sleep quality and disorders, but there are limited data directly comparing objective measures of obstructive sleep apnea (OSA) among

Black, Mexican American (MA) and non-Hispanic White (NHW) populations.

Methods: To date, the ongoing Health & Aging Brain among Latino Elders (HABLE)-Dormir study has enrolled 761 participants using a community-based participatory research approach. Here we describe OSA indices assessed by in-home assessments using WatchPAT, a Peripheral Arterial Tonometry (PAT)-based home sleep testing system that is validated for the diagnosis of OSA.

Results: Participants had a mean age of 65.6 $\pm$ 8.2 (50-90) years, comprised of 64% women; 34% MA, 24% Black and 42% NHW adults. Over half (52.0%) of the participants had moderate or more severe OSA as defined by the respiratory event index (REI based on 3% desaturations) of ≥ 15 /hour, 73.1% with REM-OSA (REM-REI ≥ 15 /hour) and 40.6% with NREM-OSA (NREM-REI ≥ 15 /hour). The median of the average snoring volume through the night was 41 (40-61) dB. The median percentage of sleep time spent with oxygen saturation below 90% (SpO₂ < 90%) was 1.0%. After adjustment for age, sex, Body Mass Index, cognitive status, and history of hypertension, diabetes, stroke and heart attack, Black and MA participants were 71% and 55% more likely to have REM-OSA compared to NHW participants ($p=0.04$), but had similar prevalence of NREM-OSA ($p=0.80$) and overall OSA ($p=0.32$). The adjusted mean percentage of sleep time spent with over 40dB snoring volume was higher among Black (22.7%, $p=0.03$) and MA adults (21.2%, $p=0.11$) than NHW adults (18.5%). The adjusted mean prevalence of nocturnal hypoxemia (SpO₂ < 90% time $\geq 1\%$) was similar among Black (48.2%), MA (51.7%) and NHW (50.0%) adults; $p=0.83$.

Conclusion: In this middle-to-older-aged population, PAT-based measures of OSA indicate a higher prevalence in minoritized adults of REM-specific sleep apnea, a phenotype associated with increased rates of hypertension and mortality. Home-based measures that do not distinguish between REM and NREM respiratory events may underestimate sleep apnea in these groups.

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0441

POSITIVE AIRWAY PRESSURE THERAPY ASSOCIATED CHANGES IN VENTRICULAR REPOLARIZATION IN PATIENTS WITH HEART FAILURE

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Introduction: Obstructive sleep apnea (OSA) is associated with prolonged ventricular repolarization at baseline that further increases during sleep when an apnea/hypopnea event occurs. Aggressive treatment of OSA with positive airway pressure therapy (PAP) may further prolong ventricular repolarization during apnea/hypopnea events particularly in patients with heart failure (HF). The goal of this study was to evaluate how ventricular repolarization changes during apnea/hypopnea events in patients with heart failure with reduced (HFrEF) and preserved (HFpEF) ejection fraction and in those patients without HF.

Methods: Thirty patients with OSA in each of the following groups were randomly selected from a dataset of 2,817 patients: HFrEF, HFpEF and no HF failure. Overnight polysomnographies (PSG) for these patients were reviewed and beat-to-beat measurements during apnea/hypopnea events were obtained at baseline (without PAP) and on the highest PAP setting attempted. Fridericia's heart rate corrections were used to calculate QTc. QT variability was measured as the standard deviation of QT intervals (SDQT).

Results: The electrocardiogram was analyzable for $n=11$ with HFrEF (age 71 $\pm$ 17 years, 91% male), $n=28$ with HFpEF (age 71 $\pm$ 12 years, 43% male) and $n=30$ without HF (age 57 $\pm$ 12 years, 50% male). In those with HFrEF, the mean (SD) QTc increased from 442(12)ms to 452(13)ms and SDQT increased from 9(2) to 13(2) from baseline to the highest level of PAP attempted. In those with HFpEF, the mean (SD) QTc decreased from 448(8) to 436(8) ms and SDQT increased from 10(1) to 11(1) from baseline to the highest level of PAP attempted. In those without HF, the mean (SD) QTc increased from 429(37) to 439(56) and SDQT was stable from 8(6) to 8(8) from baseline (no PAP) to the highest level of PAP attempted. There were significant differences noted between the groups in changes in QTc ($p=0.002$) and SDQT ($p=0.048$) on PAP when compared to baseline.

Conclusion: Patients with HFrEF had increases in both QTc and SDQT with PAP at high pressures placing them at greater risk for ventricular arrhythmias.

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0442

PROGRESS IN THE SUPRA TRIAL FOR THE TREATMENT OF CPAP-INTOLERANT OSA PATIENTS: AHI AND SAFETY

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Introduction: An external collar with ~ 30 cmH₂O vacuum applied to the anterior neck can expand the oro- and naso-pharynx and improve Pcrit (Kato et al 2015- PMID: 25614595). The hypothesis of SUPRA (Study Using Negative Pressure to Reduce Apnea - NCT04861038) is that the self-contained vacuum device (aerSleep® II) can treat obstructive sleep apnea (OSA) in those unable to use CPAP.

Methods: Conducted at 15 sleep centers in the United States, CPAP-intolerant subjects meeting eligibility (age >18 yrs, BMI < 42, and an untreated AHI4% by Nox T3 HSAT of 15-50/hr) were fitted to one of three collar sizes. After a 7-day acclimatization trial, those that showed a >50% reduction in AHI4% to less than 20/hr ("Responders") and accepted therapy agreed to 6 months of supervised treatment, with final assessments at 6 months. 7-day and 6-month end-points reported here are AHI and safety.

Results: Of screened subjects, 50.2% were excluded, most frequently due to baseline AHI being too high or, mostly, too low (72%). 110 subjects (59 $\pm$ SD11 years, 43% Female, 84% Caucasian) met study criteria. Following device acclimation, 28

(50%) did not meet 7-day pre-selected on-treatment AHI criteria. In 23 subjects (41%), AHI reduced from 26.6 ± 8.5 to 8.1 ± 5.6 ($p=0.001$), and these Responders differed from non-responders (AHI from 32.7 ± 13.1 to 26.7 ± 9.4 , $p=0.06$) in regard to reductions in apneas and hypopneas and ODI; non-responders had converted to hypopneas. During the 6-month phase, 7 withdrew consent. In all, local irritation occurred in 29 instances in 28 participants, resolving with 1-3 days of discontinuation, and therapy resumed. Eight have completed 6 months without safety issues, and 7 continued to exceed AHI efficacy endpoints.

Conclusion: We conclude that the aerSleep II device, with current collar sizes and pressure, can reduce the AHI burden at 7 days and continues for 3-6 months without major safety concerns.

Support (if any): Presented for the SUPRA Study Group, supported by Sommetrics Inc, San Diego CA

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0443

PROPOSING A 'PROJECTED APNEA-HYPOPNEA INDEX (AHI)' TO MITIGATE INTRINSIC PITFALLS OF CONVENTIONAL AHI AND TESTING ITS VALIDITY

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Introduction: The night-to-night variability of apnea-hypopnea index (AHI) can be explained by the fact that a person with OSA tends to spend less time in supine position and potentially less REM sleep, during which obstructive events could be a lot worse than in the other form. The primary aim of this study is to propose and test a "projected AHI" (pAHI) with which AHI can be mathematically adjusted for sleep position and sleep stage spent in a night of recording.

Methods: Using mathematical modeling explained in a separate abstract, a final pAHI formula was generated from polysomnography data of 337 subjects who exhibited all four sleep-types [combination of REM vs NREM and supine (SUP) vs non-supine (nSUP)] in one overnight study. A confusion matrix was generated using cutoffs of (p)AHI of 5 and hypothesizing pAHI being the gold standard and AHI being the test. Among subjects with borderline results (AHI of 5 ± 3), sleep-type time and sleep-type AHI were compared between 4 groups of the confusion matrix to test the validity of the pAHI model.

Results: Out of 337 subjects with all four sleep-types, 119 subjects with AHI of 5 ± 3 were identified and classified into a confusion matrix of no-OSA (43 TN, 10 FP), and OSA (13 FN, 53 TP). Actual sleep-type AHIs were in the order of increasing pAHI (TN, FP, FN, TP): 15.3, 29.2, 32.0, 34.8 for REMSUP; 4.00, 4.53, 4.73, 9.40 for REMnSUP; 2.83, 2.87, 9.38, 10.0 for NREMSUP; 0.44, 0.1, 1.06, 1.98 for NREMnSUP. Sleep time parameters were significantly different between no-OSA and OSA groups only when pAHI was used for diagnosis: %REMSUP (9.32 vs 5.39, $p = 0.000009$), %REMnSUP (8.08 vs 11.31, $p = 0.002$), %NREMSUP (48.13 vs 36.53, $p = 0.001$), %NREMnSUP (34.46 vs 46.77, $p = 0.0002$).

Conclusion: Without having to repeat a sleep study, projected AHI, by taking the effect of sleep position and sleep stages into account, can produce an AHI that mitigates night-to-night variability stemming from position and stage differences between nights. Projected AHI can be particularly useful in interpreting a sleep study with a borderline AHI result.

Support (if any):

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0444

RACIAL DIFFERENCES IN POSITIVE AIRWAY PRESSURE REQUIREMENTS AMONGST OBSTRUCTIVE SLEEP APNEA PATIENTS (THE RACE-PAP STUDY)

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Introduction: Prior studies of patients with obstructive sleep apnea (OSA) show racial differences in clinical presentation. When compared with White patients, Black patients present with more severe OSA and greater sleepiness. Racial differences in upper airway collapsibility could explain these differences. Here, we investigated whether mean positive airway pressure (PAP) levels, a clinically accessible measure of upper airway collapsibility, differed by race in a cohort of patients adherent to PAP.

Methods: We conducted a retrospective analysis of White and Black adults with OSA who were prescribed auto-adjusting PAP (aPAP) therapy at a single academic center between January 2018 and January 2020. The analysis included adherent patients (usage on $>70\%$ of nights for ≥ 4 hours per night) with well-controlled OSA (defined as $\geq 50\%$ reduction in apnea-hypopnea index [AHI] on aPAP and residual AHI < 10). Mean PAP level was compared between White and Black patients using linear regression controlled for age, gender, body mass index (BMI), AHI, O₂ nadir, and mask type (full face, nasal, or unknown).

Results: Overall, 148 Black (56% women) and 230 White (36% women) patients were included. On average, Black patients were younger (50.7 ± 14.6 vs. 53.8 ± 12.7 years; $p=0.037$) with higher BMI (40.4 ± 9.5 vs. 34.9 ± 7.6 kg/m²; $p < 0.0001$). Black patients had less severe OSA on average, but this difference was not statistically significant (AHI of 33.9 ± 25.5 vs 38.6 ± 24.9 events/hour; $p=0.077$). After adjusting for covariates, Black patients had a 0.62 cm H₂O (95% CI: 0.21 to 1.03) higher mean PAP level than White patients ($p=0.003$). There was a larger racial difference in mean PAP level among men (0.76 [0.16, 1.35] cm H₂O; $p=0.013$) compared to a non-significant difference among women (0.34 [-0.23, 0.91] cm H₂O; $p=0.242$). While statistically significant, differences were < 1 cm H₂O and, thus, not clinically meaningful.

Conclusion: Black patients with OSA had a statistically significant but clinically insignificant difference in mean PAP level when compared with White patients. There was evidence of stronger differences in men than women. Further studies are needed to explore other potential mechanisms, including craniofacial anatomy, which may underlie racial differences in OSA presentation and outcomes.

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0445

REAL-WORLD EVALUATION OF UPPER AIRWAY STIMULATION SYSTEM SURVIVAL USING POST-MARKET SURVEILLANCE DATA

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Introduction: Upper airway stimulation (UAS) has become a viable treatment alternative for well selected patients with moderate to severe obstructive sleep apnea (OSA) who struggle to tolerate positive pressure (PAP) therapy. Post-market surveillance is required of medical device manufacturers to assess treatment outcomes, complications, and device failure. We aim to utilize this surveillance data to assess rates of revision and removal of the Inspire (Minneapolis, MN) UAS system in a real-world setting.

Methods: Post market surveillance data was compiled from manufacturer's complaint handling system for explants and revisions of the hypoglossal nerve stimulator. Data collection began in January 2018 and was available through September 30 2022 at the time of analysis. Implant procedures from January 2018 through September 2021 were analyzed for events within one year of implant. Events were classified into categories. A subset of these devices implanted before September 30 2019 were analyzed for events between one and three years after implant.

Results: Between Jan 01 2018 and Sep 30 2021, 15282 devices were implanted. Within one year of the implant, 121 devices (0.8%) were explanted for: infection (66), elective (32), MRI (10), other (10), and twiddler syndrome (3). Surgical revisions were required for 245 patients (1.6%) for: surgical correction (139), device defect (81), other (21), cardioversion (2), twiddler syndrome (1), and MRI (1). A subset of 5080 of these devices were implanted prior to September 30 2019. Between one year and three years following implant 119 devices (2.3%) were explanted for: elective (58), MRI (35), infection (15), Other (9), and twiddler syndrome (2). Surgical revisions were performed for 160 patients (3.1%) for: surgical correction (64), device defect (57), other (32), twiddler syndrome (5), and cardioversion (2).

Conclusion: As with any implantable medical device, a certain rate of revision and explant is expected for device, patient, and medical indications. The rate of UAS revision and explantation is low at both the 1 year and 3 year time points. UAS implantation is a safe alternative to CPAP for well selected patients with a low rate of unexpected reoperation for either revision or hardware explantation.

Support (if any): Inspire Medical

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0446

SLEEP DISORDERED BREATHING TREATMENT IS ASSOCIATED WITH IMPROVED MENTAL HEALTH SYMPTOMS AND QUALITY OF LIFE IN WOMEN VETERANS

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Introduction: Sleep disordered breathing (SDB) is associated with poor mental health and lower overall quality of life (QOL); however, research examining these outcomes after positive airway pressure (PAP) therapy for SDB in women is limited. We studied a 6-session PAP adherence program that included behavioral sleep improvement strategies plus concepts of Acceptance and Commitment Therapy (ACT) to promote sustained PAP use, and evaluated the impact of this ACT-based program on daytime and mental health symptoms and quality of life in a sample of women veterans with SDB who were prescribed PAP.

Methods: Women veterans with SDB (n=90, mean = 53.2 years [range 26-80]) receiving care in an urban VA healthcare system were randomly assigned to a "control" SDB/PAP education program or the "Acceptance and Behavioral Changes to treat Sleep Apnea" (ABC-SA) program. All received PAP therapy. Measures included: Epworth Sleepiness Scale (ESS), Flinders Fatigue Scale (FFS), Patient-Health Questionnaire 9-item (PHQ-9), Generalized Anxiety Disorder Questionnaire 7-item (GAD), and The World Health Organization Quality of Life Scale, Brief (WHOQOL BREF). Mixed-effect models assessed the main effect of time across groups and between-group changes in these measures at post-treatment and 3 month-follow up compared to baseline.

Results: For the main effect of time, participants in both groups had significant improvements at post-treatment and 3-month follow-up in sleepiness, fatigue, depression, anxiety, and QOL (all $p < 0.05$). Compared to controls, women who received ABC-SA reported greater improvements in daytime sleepiness (ESS) at post treatment ($p=0.04$) and in fatigue (FFS) at 3-month follow-up ($p=0.008$).

Conclusion: PAP treatment in women with SDB was associated with improvements in measures of mental health and QOL. There was some evidence of even greater benefits with ABC-SA. Further work is needed to understand the relationship between SDB treatment and improved mental health outcomes in women and other underrepresented populations.

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0447

STUDY OF PAP RESPONSE AND COMPLIANCE IN PATIENTS WITH ILD AND OSA: A CASE-CONTROL SINGLE CENTER COHORT

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Introduction: Interstitial lung disease (ILD) is a heterogeneous group of parenchymal lung disorders with multiple etiologies. ILD often affects the quality of life and survival of patients. OSA is commonly diagnosed among ILD patients with reported prevalences of 50-90%, and a prevalence of moderate to severe OSA as high as 65%. There is also concern that patients with ILD may be less tolerant of PAP therapies. We aim to identify differences in PAP treatment response and adherence in patients with ILD and OSA compared with a group of matched OSA controls.

Methods: A retrospective cohort analysis was conducted on patients ≥ 18 years-old that were evaluated at Mayo Clinic Center

for Sleep Medicine between July 2012 to June 2022. Inclusion criteria were patients with a diagnosis of ILD per ATS criteria also diagnosed with OSA by HSAT or PSG. Control OSA patients were matched to ILD/OSA patients by age, BMI, and AHI ranges. Exclusion criteria included comorbid conditions of asthma or COPD. Patients with early non-adherence to CPAP or those who didn't have sleep follow up were also excluded. Follow-up sleep visits were assessed to determine CPAP adherence, change in PAP pressure, addition of oxygen, and change in Epworth sleepiness scale.

Results: We compared 51 patients with ILD/OSA and 51 OSA matched-controls. Twenty-five ILD/OSA patients were diagnosed by PSG and 26 by HSAT. Median treatment follow-up for the ILD group was 7 months (IQR of 3 to 18 months). Baseline characteristics, including oxygen desaturation index (ODI), oxygen saturation, time spent below 89% during overnight oximetry, and baseline Epworth scale, were similar between ILD/OSA and non-ILD OSA patients. Importantly, there was no statistically significant difference in PAP adherence, median PAP levels, PAP pressure change, residual AHI, or change in Epworth after treatment.

Conclusion: There was no significant difference in baseline OSA characteristics, treatment response, and PAP adherence in ILD patients with OSA compared with matched non-ILD OSA controls. Outcome assessment may be limited by sample size and the shorter follow-up period. Future studies should include longer-term follow-up with a larger ILD cohort to assess the impact of ILD progression on PAP adherence over time.

Support (if any):

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0448

TELEMEDICINE MANAGEMENT OF OBSTRUCTIVE SLEEP APNEA DISORDER: A RANDOMIZED CONTROLLED TRIAL

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Introduction: Previous studies assessed different components of telemedicine instead of the whole telemedicine management pathway for OSA. The current study aimed to demonstrate that telemedicine management was not clinically inferior to in-person care in China based on the change in Functional Outcomes of Sleep Questionnaire (FOSQ) score following three months of an auto-adjusted positive airway pressure (APAP) treatment.

Methods: Adults suspected of OSA were randomized to telemedicine (n=178) or in-person (n=178) management. Participants with AHI ≥ 15 events/hour diagnosed by a home sleep apnea test (HSAT) were treated with an APAP with a wireless modem. The participants were followed up by call at week 1 and visit at month 1 and month 3.

Results: We measured the change in FOSQ score as the primary outcome, with an a priori noninferiority delta of -1, and the mean daily hours of objectively measured APAP adherence, with an a priori noninferiority delta of -45min/day. Of the 356 subjects enrolled, 313 (87.9%) were diagnosed with OSA, and 261 (73.3%) underwent PAP setup. The mean functional outcome score following 3 months improved 1.73 points (95%CI: 1.31, 2.14) in the telemedicine group and 2.05 points (95% CI: 1.64, 2.46) in the in-person group. The lower bound of the one-sided

95% noninferiority confidence interval was -0.812. Mean daily APAP adherence at 3 months was 243.3 minutes/night (95% CI: 223.1, 263.5) in the telemedicine arm and 241.6 minutes/night (95% CI: 221.3, 261.8) in the in-person arm. The lower bound of the one-sided 95% noninferiority confidence interval was -22.2 minutes/night. Compared to in-person management, the telemedicine pathway had lower patients cost and similar health care cost.

Conclusion: Functional outcome and treatment adherence in patients managed by a comprehensive telemedicine approach is not clinically inferior to that in patients receiving in-person care.

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0449

UNBIASED EXAMINATION OF METABOLOMIC SIGNATURES IN SLEEP DISORDERED BREATHING AND GROUP 1 PAH IN THE (PVDOMICS) COHORT

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Introduction: Metabolic alterations have been identified as a novel driver of pulmonary arterial hypertension (PAH) pathogenesis. Sleep disordered breathing (SDB), characterized by intermittent hypoxemic episodes, has also been implicated in PAH, particularly when associated with more profound degrees of hypoxia, and metabolic dysfunction. We hypothesize to observe in SDB and PAH in humans a similar pattern of metabolic alterations as previously described in animal models of PAH.

Methods: Pulmonary Vascular Disease Phenomics (PVDOMICS, NCT02980887), a multicenter study, was designed in part to elucidate molecular signatures in PH. We analyzed data from Group 1 PAH participants who underwent home sleep apnea testing with circulating plasma metabolomic measures (Metabolon). We conducted an unbiased analysis of SDB measures: apnea-hypopnea index (AHI, 3% oxygen desaturation hypopnea definition) and % recording time < 90% SpO₂ (TRT < 90%), with metabolites (954 after qc filtering) using a flexible and robust semi-parametric proportional hazards model adjusted for age, sex, body mass index (BMI), diabetes mellitus (DM), race and study site. Metabolites with False discovery rate (FDR) adjusted p-values < 0.1 were called significant. Closed-set testing with the Simes method and Metabolon provided annotations (90 sets) was used to test metabolite sets.

Results: The cohort (n=175) was 72% female, 81% White and 16% DM with (1st Quartile/Median/3rd Quartile) Age: 42/54/63 years, BMI: 24.6/29.1/34.1 kg/m², AHI: 0.9/4.3/12.6 and TRT < 90%: 2.3/37/87.4. 21 metabolites showed significant association with TRT < 90% (8 with positive direction/13 negative) and 0

with AHI. Among metabolite sets, Pregnenolone steroids had the strongest association with TRT < 90% (6 members; adjusted $p=0.038$; True Discovery Proportion (TDP)=0.33) followed by Fatty Acid Metabolism (Acyl Choline) (7 members; adjusted p -value=0.046; TDP=0.71) and Polyamine Metabolism (7 members; adjusted p -value $p=0.054$; TDP=0.14).

Conclusion: Three primary metabolite pathways were associated with sleep-related hypoxia in Group 1 PAH. Polyamine metabolism and fatty acid metabolism changes have previously been observed in a rat PAH model, consistent with our findings. Findings specific to metabolic biomarkers in SDB and PAH are novel and may lead to insights that broaden our understanding of PAH pathobiology and potential therapeutic targets.

Support (if any):

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0450

BACKSCATTERED ULTRASOUND IMAGING OF THE TONGUE CORRELATES WITH SEVERITY OF OBSTRUCTIVE SLEEP APNEA IN ADULTS

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Introduction: Determination of intervention to manage obstructive sleep apnea (OSA) is dependent on clinical examination, polysomnography results, and imaging analysis. There remains the need of a non-invasive and cost-effective way to correlate relevant upper airway anatomy with severity of obstructive sleep apnea (OSA) to direct treatment and optimize outcome. We aimed to determine whether ultrasonography with backscattered imaging (BUI) analysis of the tongue correlates with severity of OSA in adults.

Methods: A prospective, single-center, observational study of a consecutive series of patients (aged 18 years and older) visiting our sleep clinic. All included patients had a polysomnography (PSG) within 3 years from the moment of BUI analysis. Patients were excluded if their BMI had changed more than 10%. We used and standardized the submental ultrasound scan with a laser alignment tool and applied BUI analysis to the tongue. Outcomes were correlated to the patients' AHI, BUI results were compared to only echo intensity.

Results: Eighty-nine patients were included between July 2020 and March 2022. Mean age was 38.8 ± 12.7 years, mean BMI was 26.7 ± 5.0 kg/m², and mean AHI was 17.5 ± 16.8 events/h. Significant differences were found between the subgroups with AHI < 15 and ≥ 15 events/h at specific regions of the tongue base using BUI analysis, echo intensity showed no significant differences. BUI values showed a positive correlation with AHI, with Pearson correlation coefficient of 0.42 and 0.37, and Spearman correlation coefficient of 0.43 and 0.43 for the A and B regions of the tongue, respectively. Higher BUI values are associated with more severe AHI, even after correction for covariates (BMI and age).

Conclusion: Standardized ultrasound scanning of the tongue with backscattered imaging analysis yields strong correlation with severity of OSA. With the intrinsic advantages in the use of ultrasonography in outpatient settings, this analysis is pivotal in reducing the gap between anatomy and physiology in clinical decision-making for treating OSA.

Support (if any): None

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0451

DRONABINOL PLUS ACETAZOLAMIDE FOR THE TREATMENT OF OBSTRUCTIVE SLEEP APNOEA: A PROOF OF CONCEPT AND MECHANISTIC EXPLORATION STUDY

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Introduction: Current treatments for obstructive sleep apnoea (OSA) typically target the anatomical pathophysiological endotype and are either not tolerated or effective in a significant proportion of patients. Pharmaceuticals may provide an alternative therapeutic option and may address some or all of the remaining endotypes (loop gain, muscle compensation and arousal threshold). This randomised, double-blind, placebo-controlled, crossover study examined the effect of combination acetazolamide and dronabinol (IHL-42X) at low, medium and high doses on OSA severity and the OSA endotypes.

Methods: Participants with OSA (apnoea-hypopnoea index; AHI ≥ 15 events/hr) received 1-week of IHL-42X at each of the 3 doses and 1-week of placebo, each separated by 1-week wash-out. The change from baseline in AHI, oxygen desaturation index (ODI), Epworth sleepiness score (ESS), and mood (profile of mood states) on the final night of each treatment arm relative to placebo were the major endpoints. Adverse events (AEs) were monitored throughout. Exploratory analyses examined the change in OSA endotypes determined from polysomnography from baseline values.

Results: Ten of 11 participants (mean baseline AHI 40.7 events/hr) completed the final night of at least one treatment arm. All doses of IHL-42X demonstrated a significant reduction in AHI from baseline when compared with placebo (low, -19.7 ± 27.1 ; medium, -17.5 ± 23.3 ; high, -16.4 ± 23.8 versus placebo, -2.8 ± 21.0 events/hr; all $p < 0.05$). The change from baseline in ODI $\geq 3\%$ at the low, medium and high doses of IHL-42X (-15.2 ± 24.8 ; -15.4 ± 19.0 and -8.3 ± 13.2 events/hr, respectively) were not significantly different from placebo (-2.8 ± 21.0 events/hr).

hr). IHL-42X did not significantly alter ESS or mood. No serious AEs occurred. However, 31 mild-moderate possibly, probably or treatment related AEs occurred during IHL-42X dosing (4 at the low dose) and 4 occurred during placebo. Relative to baseline, loop gain decreased by 15, 21 and 20% (Cohen's d all ≥ 0.59) at the low, medium and high doses, respectively, and collapsibility improved by 12.5% ($d=1.06$) at the low dose only.

Conclusion: One week of nightly IHL-42X at all doses was well tolerated, safe and associated with significant reductions in OSA severity. IHL-42X may act to reduce OSA severity by decreasing loop gain and upper airway collapsibility, particularly at the low dose.

Support (if any): Incannex Healthcare Ltd supported this study.

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0452

MILD-TO-MODERATE OSA AND MORTALITY IN GENERAL POPULATION: THE MODIFYING EFFECT OF AGE AND CARDIOVASCULAR/CEREBROVASCULAR MORBIDITY

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Introduction: Mild-to-moderate obstructive sleep apnea (mOSA) is highly prevalent in the general population and is highly comorbid with cardiovascular and/or cerebrovascular diseases (CBVD). We examined the association between mOSA and all-cause mortality and the modifying effect of age and CBVD.

Methods: A total of 1681 adults 20-88 years old from the Penn State Adult Cohort (41.9% male, 10.5% racial/ethnic minority) were followed up for 20.1 ± 6.2 years for all-cause mortality. The presence of mOSA was defined as an apnea/hypopnea index from 5-29.9 events/hour. CBVD was defined as a report of diagnosis or treatment for heart disease and/or stroke. Cox proportional hazards regression models were used to estimate all-cause mortality adjusted for confounders.

Results: All-cause mortality risk was significantly increased in the mOSA group in young and middle-aged adults (< 60 years) (HR=1.59, 95%CI 1.08-2.04) but not in older adults (≥ 60 years) (HR=1.05, 95%CI 0.80-1.39). We observed a synergistic effect between mOSA and CBVD that was stronger in those < 60 years (HR=3.82, 95%CI 2.25-6.48 in < 60 years vs 1.86 95%CI 1.14-3.04 in ≥ 60 years). There was an additive effect between mOSA and hypertension in < 60 but not in those ≥ 60 years (mOSA and hypertension HR=2.39, 95%CI 1.56-3.66 vs. 1.09 95%CI 0.75-1.57).

Conclusion: Mortality risk is increased in young and middle-aged adults with mild-to-moderate forms of OSA. The risk is even stronger in the presence of CBVD/hypertension. It appears that AHI cut-offs warranting treatment of mOSA should be adjusted based on age and prevalent clinical disorders.

Support (if any):

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0453

3-YEAR OUTCOMES OF PROXIMAL HYPOGLOSSAL NERVE STIMULATION IN THE THN3 CONTROLLED TRIAL

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Introduction: The THN3 randomized, controlled trial of moderate to severe obstructive sleep apnea (OSA) showed that proximal ("targeted") hypoglossal nerve stimulation (HGNS) safely improved sleep-disordered breathing (SDB) and quality of life (QOL) through 11 months of treatment. Outcomes of subjects receiving active proximal HGNS also surpassed those with inactive therapy 4 months post-implant. Herein 3-year outcomes of THN3 are reported and compared to distal HGNS (STAR trial).

Methods: THN3 OSA subjects (Apnea-Hypopnea Index, AHI, 20-65/hr; BMI ≤ 35 kg/m², no drug-induced sleep endoscopy screening) were followed long-term. Complete data through 3-year follow-up were analyzed. Efficacy measures comprised AHI, Oxygen Desaturation Index (ODI), %sleep time O₂ saturation $< 90\%$ (T90), Epworth Sleepiness Scale (ESS), Functional Outcomes of Sleep Questionnaire (FOSQ) EQ-5D Visual Analog Scale (VAS) and Snore Outcomes Survey (SOS). 36-Month medians were compared against those after 11 months of therapy (Month 12/15) and with STAR. Adverse events (AEs) during Months 12-36 for THN3 and STAR were also compared.

Results: 75% of THN3 participants (104/138) attended 3-year follow-up, with complete efficacy records in $N \geq 93$ except for SOS ($N=67$, not administered at all sites). Proximal HGNS produced clinically and statistically significant improvements in SDB and QOL at Month 12/15 that were closely maintained at 36 Months (median paired changes at Month 36 from Baseline/Month 12/15: $\square$ AHI:-18.2/-0.1, $\square$ ODI:-16.2/0.8, $\square$ T90:-1.8/0.2, $\square$ FOSQ:3.0/0.0, $\square$ ESS:-5.0/0.0, $\square$ VAS:5.0/0.0, $\square$ SOS:37.5/3.1) and were comparable to STAR at 36 Months ($\square$ AHI:-19.4, $\square$ ODI:-17.2, $\square$ T90:-1.5, $\square$ FOSQ: 2.6, $\square$ ESS:-4.0). Procedure- and device-related AEs respectively totaled (3 and 27)/(4 and 122) in THN3/STAR over Months 12-36. During this time, 3 severe related-AEs occurred in THN3; the

most frequent related AEs involved tongue discomfort (N=8, device-related).

Conclusion: Improvements in sleep apnea and QOL on proximal HGNS at Month 12/15 persisted through at least Month 36. Proximal HGNS long-term efficacy was comparable to distal HGNS. AEs occurred uncommonly during long-term follow-up and were typically mild. Proximal HGNS is a safe, effective, stable, long-term therapy, yielding comparable improvements to distal HGNS in treating moderate to severe OSA. Results of the ongoing, confirmatory OSPREY randomized controlled trial will provide additional insights into therapeutic benefits of proximal HGNS.

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0454

A SPECIFIC STOP-BANG SCORE CUTOFF IS NOT PREDICTIVE OF SEVERE OBSTRUCTIVE SLEEP APNEA IN BARIATRIC PATIENTS

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Introduction: Obstructive sleep apnea (OSA) is a common sleep disorder with obesity being a significant risk factor. Undiagnosed OSA increases the risk of complications at the time of surgery and those with severe OSA at increased risk of post-operative MI, stroke, arrhythmias, and death as well as readmission and acuity of post-operative care. Because of this, our Bariatric program screens all patients pre-operatively with a STOP-BANG questionnaire. Those with severe OSA (AHI or REI > 29) require pre-treatment with PAP therapy until compliance is reached before the patient is eligible for surgery. This study examines those that screened at high risk for OSA with a STOP-BANG score > 2 to see if there was a specific cutoff that predicts those having severe OSA in order to better expedite sleep testing as recent supply chain issues have greatly impacted the timeliness of care for these patients.

Methods: During the months of January to June 2022, demographic, clinical and sleep data was collected on all new patients being evaluated by the Bariatric Sleep clinic for use in quality assessment. Bariatric patients with BMI < 50 and no significant cardiac or pulmonary disease were tested using HSAT, whereas those who met one or more of the above comorbidities underwent PSG.

Results: There were 143 bariatrics patients who screened as "high risk" for OSA with a STOP-BANG score > 2 during these 6 months and 112 (78%) of them completed sleep testing. There were 25 patients (22%) with severe OSA. The average STOP-BANG score for those with severe OSA was 4.3. Women averaged 4.0 (range 3-6), while men averaged higher at 4.8 (range 4-6) likely reflecting that male gender garners an extra point with the STOP-BANG. STOP-BANG scores increased with age: 20s x=3, 30s x=4.1, 40s x=4.4, 50s x=4.6, 60s x=6.

Conclusion: There was no specific cutoff for the STOP-BANG score that predicted severe OSA in our bariatric patients to help our program triage those most at surgical risk in order to place

them in an expedited sleep testing and PAP therapy pathway. Overall, STOP-BANG scores were impacted by gender and age.

Support (if any):

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0455

ASSOCIATION OF HIGH-RISK OBSTRUCTIVE SLEEP APNEA WITH ENDOTHELIAL DYSFUNCTION IN A LARGE POPULATION-BASED SAMPLE IN MIHEART STUDY

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Introduction: Obstructive Sleep Apnea (OSA) is associated with endothelial dysfunction and cardiovascular disease (CVD). There are limited data evaluating the association with endothelial dysfunction measured by reactive hyperemia index (RHI) in an asymptomatic population free of CVD. We hypothesized that there would be a significant association between high risk of OSA and endothelial dysfunction in the Miami Heart (MiHeart) study, a population-based cohort of relatively young individuals free of known cardiovascular disease (CVD).

Methods: Cross-sectional data from 2097 participants (mean age: 53 years, 50% female) enrolled in the MiHeart study and underwent flow-mediated dilation using the EndoPat 2000 system was analyzed for this study. OSA was determined by Berlin questionnaire (high vs. low risk); logistic regression was utilized to examine the association between high OSA risk (reference low-risk OSA) and RHI (cut off < 1.67 vs. ≥1.67) in unadjusted models, and after accounting for age, sex, race/ethnicity (model 2), and BMI, diabetes, hypertension, high cholesterol, and smoking (model 3).

Results: 704 (34%) participants were categorized as high OSA risk, according to the Berlin questionnaire. These participants were more likely to be male, Hispanic and had a higher CVD risk factor burden when compared to low OSA risk. In addition, those with high OSA risk had higher prevalence of endothelial dysfunction (17.5% vs. 13.9%) than the low OSA risk (p < 0.05) group. High risk of OSA was associated with a higher risk of endothelial dysfunction in the unadjusted model (OR=1.32, 95% CI 1.03, 1.68). When adjusted for age, sex, and race/ethnicity, this association was slightly attenuated (OR 1.26, 95% CI 0.97, 1.62). Upon adjusting for CVD risk factors (model 3), the association between high-risk OSA and endothelial dysfunction was further attenuated and was not statistically significant (OR=1.18, 95% CI 0.87, 1.59). There was a strong, independent association between presence of diabetes and endothelial dysfunction (OR= 2.01, 95% CI 1.35, 2.94).

Conclusion: Younger individuals with high risk for OSA have elevated odds of endothelial dysfunction, and this relationship is likely mediated by demographics and cardiometabolic risk factors such as diabetes.

Support (if any): The Miami Heart Study is funded by Baptist Health South Florida.

Abstract citation ID: zsad077.0456

0456**ASSOCIATION OF MOCA SCORES IN INDIVIDUALS WITH MILD COGNITIVE IMPAIRMENT-ALZHEIMER DISEASE AND OBSTRUCTIVE SLEEP APNEA**Wahaaj Khan¹, Winnie Pao¹, Reena Mehra²¹ Cleveland Clinic, ² Sleep Disorders Center, Neurological Institute, Cleveland Clinic

Introduction: Mild cognitive impairment (MCI) is considered a transitional stage between normal aging and dementia. Studies have demonstrated an association with rate of progression of MCI and dementia in individuals with OSA compared to those without OSA. The varying degree of hypoxia, sleep fragmentation and poor quality of sleep in OSA patients has been associated with increased risk of stroke, memory impairment, cardiac arrhythmias, dyslipidemia, hypertension, obesity and glucose intolerance. Identifying different variables in sleep study that can be linked with MCI and AD is helpful. We compared patients' MOCA score at the time of sleep study and compared it with multiple macro and micro variables tested on the sleep study.

Methods: Data was presented as mean $\pm$ (SD) or median [25th, 75th percentiles] for continuous variables and N (%) for categorical variables. Comparisons were performed between baseline MOCA groups (0-17 vs. 18-30) using two-sample T-test or Wilcoxon rank sum test for continuous variables based on distribution, and chi-square test or Fisher's exact test for categorical variables. Linear regression was used to assess the relationship between baseline MOCA and sleep measures before and after adjustment for covariates. Covariates included age, gender, race, and BMI.

Results: Patients with smaller MOCA score were older (71.4 ± 8.7 vs. 68.1 ± 9.4 , $p=0.002$), predominantly black (17.8% vs. 10.8%, $p=0.013$), weigh lower (median [IQR]: 80.5 [69.2, 94.0] vs. 86.2 [74.0, 99.0], $p=0.023$) and had less prevalence in ADHD, anxiety, depression, GERD and headache ($p=0.034$, 0.024, 0.013, 0.016, 0.040, respectively). After covariates adjustment (age, sex, race and BMI), when percent sleep time with $\text{SaO}_2 < 90\%$ increase 10%, MOCA would decrease 0.24 (coefficient -0.21, 95%CI [-0.41, -0.01], $p=0.043$); when SaO_2 nadir increased 10%, MOCA would increase 0.68 (coefficient 0.68, 95%CI [0.05, 1.32], $p=0.035$); when sleep stage %N1 increased 1%, MOCA would decrease 0.04 (coefficient -0.04, 95%CI [-0.08, -0.01], $p=0.011$).

Conclusion: Changes in oxygen levels during sleep showed direct correlation between MOCA score in individuals with MCI and AD, at the time of sleep study. Decline in MOCA scores were directly associated with degree of hypoxia observed during the sleep studies. The study showed association of worsening MCI and AD with lower oxygen levels in patients with OSA.

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0457**CARDIOPULMONARY COUPLING AS AN ALTERNATIVE TO CLASSIC HOME SLEEP APNEA TESTING: HEAD TO HEAD ASSESSMENT**Jerald Simmons¹, Robert Thomas², Keri Gregory³, Cole Feuquay³, Chris Mann³¹ Comprehensive Sleep Medicine Associates, PA, ² Beth Israel Deaconess Medical Center, ³ CSMA

Introduction: Standard HSATs directly measure airflow and chest-movements to diagnose OSA. Indirect measures such as Cardiopulmonary-Coupling (CPC) now FDA approved as "Software-as-a-medical-device" are gaining utilization. The FDA assessment of CPC was from NPSG oximetry recordings to which it was compared. SleepImage (SI) recently made CPC commercially available using ring-based oximetry. Out of lab "real-life" validation or head-to-head comparisons of SI-CPC-ring based HSATs to traditional nasal cannula / strain gauge sensor HSTs has ever been published. We performed a Head-to-head study of SI-CPC Ring system to two different HSTs, ApneaLink (AL) by ResMed and Z-Machine (ZM) by General Sleep Corporation. The ZM also provides an EEG derived assessment of sleep stage.

Methods: Patients undergoing AL or ZM HSAT studies were simultaneously placed on SI-CPC-ring devices. Statistical assessments consisted of Bland-Altman-plots and correlation-coefficients to assess for similarity of these devices. Here we report 3% AHI (analogous to the 1A AHI) and 4% AHI (analogous to the 1B AHI). Additionally Total-Sleep-Time (TST) and Sleep Efficiency (Slp-Eff) are reported with the ZM, which utilized EEG to provide these parameters.

Results: AL-vs-SI-CPC N=44. ZM-vs-SI-CPC N=50. The Bland-Altman-plot and correlation-coefficients demonstrates SI-CPC provided statistically similar results. AL-3% AHI ($\bar{X}$ 20.3, ± 21.8) vs SI-sAHI3% ($\bar{X}$ 24.2, ± 25.2) MD: -6.641 (CI -10.127 to -3.154) Range 3.800 to 110.000, R= 0.923 AL-4% AHI ($\bar{X}$ 15.8 ± 21.4) vs SI-sAHI4% ($\bar{X}$ 15.8 ± 25.5) MD: 0.132 (CI -2.489 to 2.753) Range 0.000 to 105.600, R= 0.952 ZM-3% AHI ($\bar{X}$ 15.2 ± 30.0) vs SI-sAHI3% ($\bar{X}$ 13.8 ± 19.4) MD: 1.334 (CI -2.709 to 5.377) Range -27.121 to 29.789 R=0.92 ZM-4% AHI ($\bar{X}$ 1.5 ± 27.7) vs SI-sAHI4% ($\bar{X}$ 8.9 ± 17.4) MD: 1.598 (CI -1.917 to 5.113) Range -23.135 to 26.331 R=0.95 ZM-TST ($\bar{X}$ 355 ± 92) vs SI-TST ($\bar{X}$ 355 ± 86.0) MD: 0.076 (CI -24 to 24) Range -171 to 171 R=0.59 ZM-Slp-Eff ($\bar{X}$ 0.818 ± 0.115) vs SI-Slp-Eff ($\bar{X}$ 0.826 ± 0.120) MD: -0.008 (CI -0.044 to 0.027) Range -0.258 to 0.241 R=0.44

Conclusion: HSATs with SI-CPC-ring is an easier method to administer than HSATs using air-flow and chest-sensors. This head-to-head study may enhance adoption of this type of testing, using indirect measures since the SI-CPC-ring system is not inferior, as demonstrated in our study.

Support (if any):

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0458**CARDIOVASCULAR AND SOCIOCULTURAL FACTORS ARE ASSOCIATED WITH SLEEP BREATHING DIFFERENCES IN A DIVERSE HISPANIC/LATINO COHORT.**Kevin Gonzalez¹, Wassim Tarraf², Eena Kosik¹, Kenton Guarian¹, Bradley Voytek¹, Hector González³, Alberto Ramos⁴¹ UCSD, ² Wayne State, ³ University of California San Diego,⁴ University of Miami Miller School of Medicine

Introduction: Obesity and or obstructive sleep apnea (OSA) can impact awake breathing patterns, such as increments in the breathing rate. However, little is known about their associations with breathing dysregulations during sleep beyond the apnea-hypopnea events. Understanding this could help elucidate treatment mechanisms or different pathways for disease. Furthermore, there is a strong connection between breathing patterns and cardiovascular disease, thus it is also critical to understand the links between cardiovascular risk factors and disease (CVD) and sleep breathing patterns.

Methods: The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) is a prospective multicenter study of diverse Latinos. A total of N=16,415 participants from four major metropolitan areas and six different Hispanic/Latino backgrounds were sampled for appropriate generalization to the target population. Participants were given an ARES unirecorder device (Carlsbad, San Diego) for a single night of unsupervised at home recording (N=12,022). Raw data from cannula channel (sampled at 10Hz) was processed using the python Bycycle package. Bycycle is a cycle-by-cycle approach to analyzing time series data. Bycycle finds all peaks and troughs in cycles and allows users to extract time dependent information of cycles. We extracted breathing rate (breaths per minute), breathing variability (interquartile range of breathing rate) and time spent in inhalation phase (percent time).

Results: In multivariable models (N=10,175), age was linked to decreased breathing rate, breathing variability, and time spent in inhalation phase. Compared to females, males had higher breathing variability and spent more time in the inhalation phase. Compared to Mexicans and? Central Americans, Cubans, Dominicans, and Puerto Ricans had less time spent in inhalation phase. Dominicans and Puerto Ricans also had increased breathing rate compared to Mexicans. Smoking, body mass index, and moderate to severe OSA were associated with increased breathing rate and variability. Systolic, but not diastolic blood pressure, was associated with increased breathing rate. We found no significant associations with cardiovascular disease.

Conclusion: Factors commonly linked to OSA were associated with increased breathing rate, a compensatory mechanism for optimal oxygenation, and breathing variability. Given cessation or reduced breathing during an apnea-hypopnea event, breathing variability may add more precision to account for varying oxygen demands.

Support (if any):

Abstract citation ID: zsad077.0459

0459**CARDIOVASCULAR ENDPOINTS FOR OBSTRUCTIVE SLEEP APNEA WITH TWELFTH NERVE STIMULATION: MEASURES OF SLEEP-RELATED FUNCTION**Akshay Tangutur¹, Yi Cai¹, Brendan Keenan¹, Mathias Basner², Raj Dedhia¹¹ University of Pennsylvania, ² University of Pennsylvania

Introduction: Obstructive sleep apnea (OSA) is an increasingly prevalent sleep-related breathing disorder linked to cognitive dysfunction and daytime sleepiness. Positive airway pressure (PAP) therapy, the first-line treatment for OSA, may improve cognitive function and sleepiness, but responses vary. Hypoglossal nerve stimulation (HGNS) is a novel and effective PAP alternative, but its effect on mitigating cognitive decline secondary to OSA is unknown. In the first sham-controlled HGNS trial, we evaluated the effect of HGNS therapy on cognitive measures and patient-reported outcomes (PROs) in patients with moderate-severe OSA.

Methods: In a double-blind, sham-controlled, randomized crossover therapy trial, patients already stabilized on HGNS therapy underwent four weeks of active and four weeks of sham HGNS, each with a 1-week washout period. Sham therapy was defined as the lowest voltage at which HGNS was sensed by the patient or visualized by the clinician. Cognitive measures (Psychomotor Vigilance Test [PVT], Digit Symbol Substitution Task [DSST]) and sleep-related PROs (Epworth Sleepiness Scale [ESS], Snoring Visual Analog Scale [VAS], Insomnia Severity Index [ISI], Functional Outcomes of Sleep Questionnaire [FOSQ]) were assessed after each 4-week period and compared between active and sham therapy.

Results: Sixty randomized patients were included. On average, participants were elderly (67.3±9.9 years), overweight (BMI 28.7±4.6 kg/m²) and had severe OSA prior to HGNS therapy (AHI 33.1±14.9 events/hour). Patients' AHI decreased to 23.0±15.6 events/hour with sham therapy (p=0.0001) and 18.1±14.8 events/hour with active therapy (p<0.0001), with a 4.9 event/hour decrease between active and sham therapy (p=0.014). There were no significant differences in performance measures on PVT or DSST between active and sham HGNS. All sleep-related PROs were statistically significant with moderately large (effect sizes ~0.41-0.56) improvements following active HGNS.

Conclusion: The HGNS system permits a unique investigation of the therapy "on/off" effect on measures of cognitive function. In the first sham-controlled, randomized crossover trial of patients using HGNS, all sleep-related PROs, but not objective measures of cognition, were significantly different between sham and active (therapeutic) levels. These findings warrant additional investigation examining the relationship between subjective and objective measures of function in OSA.

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0460**CHALLENGES WITH ADMINISTRATIVE CLAIMS DATA TO ASSESS HEALTH DISPARITIES IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA**Kate Cole¹, R Benjamin Dexter², Naomi Alpert¹, Suyog More², Ann Cameron¹, Leanne Kaye¹, Helena Lyson¹, Meredith Barrett¹, Will McConnell¹, Kimberly Sterling¹¹ ResMed Science Center, ² ResMed Science Centre

Introduction: Health disparities adversely affect people based on characteristics that are historically linked to discrimination or exclusion. There is limited research on understanding consequences of health disparities in the diagnosis and treatment of

obstructive sleep apnea (OSA). This retrospective study sought to investigate health disparities affecting OSA patients using real-world data.

Methods: A national sample of administrative claims data from OSA patients who had a claim for a sleep test (home sleep test or polysomnography) was used. Gender, insurance payer, race/ethnicity, and 3-digit zip code were characterized from the claims data at the time of the first sleep test to describe differences across patients.

Results: The sample included about 2 million patients with 44.9% female, an average age 51.0 years, and an insurance payer breakdown of 74% commercial, 18% Medicaid, and 8% Medicare Advantage. There were a number of challenges that made it difficult to draw conclusions about the impact of health disparities in this data. The source of gender data was unknown; therefore, we do not know if it represents identified gender or biological sex. Race/ethnicity data was listed as “unknown” for 89% of commercial patients, 18% of Medicaid patients, and 36% of Medicare Advantage patients. Data reporting did not allow for details on multiple races or separation of race and ethnicity. Using 3-digit zip codes proved to be unreliable for drawing conclusions about a patient’s residence and access to care as 3-digit zip code areas are heterogeneous and could cover a small section of a major city, a large rural portion of a state, or both. Lastly, ICD-10 Z codes, which describe social determinants of health (SDOH), appear to be underutilized.

Conclusion: Currently, using administrative claims as a real-world data source to assess health disparities is difficult due to data incompleteness, lack of adequate data definitions, and data aggregations made to protect patient privacy. Strategies to increase usability of claims data for investigating health disparities may include improvements in payer data reporting, increased utilization of SDOH Z codes, and linking to other more patient-centric data sources. Analyzing large samples of real-world data may help identify disparities and improve care for all patients.

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0461

CPAP ADHERENCE IN COMMERCIAL BUS DRIVERS IN A PUBLIC TRANSPORTATION COMPANY

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Introduction: We have been serving a sleep health promotion in a local public transportation company. One of the projects is OSA screening for all commercial bus drivers. In addition, since April 2018, we have made provision for the CPAP adherence, that is, all of the bus drivers have been monitored adherence, and if CPAP adherence was poor for two consecutive times, an interview with us is mandated. In case of the drivers whose adherence is not improved after the interview, they must be away from driving until CPAP adherence is improved. Thus, we hypothesized such a provision makes CPAP adherence better as compared with real-world data of CPAP adherence in Japan (45.6%) which was our presentation at the SLEEP 2022.

Methods: Pulse oximetry-based OSA screening is performed for all of the commercial bus drivers in the public transportation company. In case of 3% oxygen desaturation index ≥ 15 , In-lab diagnostic PSG is performed. The drivers who are prescribed

CPAP must submit CPAP adherence data sheet basically every month. Using the data of current employed bus drivers, we calculated the prevalence of OSA and recent CPAP adherence for a total of more than 90 days. CPAP adherence was defined as CMS criteria.

Results: The total number of commercial bus drivers in the company was 1237, of which 131 were diagnosed with OSA, 123 were CPAP users. The prevalence of OSA was 10.6%. Among 123 of CPAP users, 7 drivers lost the CPAP adherence data sheet, 1 driver was absent for a long time due to a malignant disease, and 2 drivers have recently started CPAP therapy, so CPAP adherence for 90 days could not be obtained. Eventually, CPAP adherence was assessed with 113 CPAP users. Eighty-seven drivers achieved CMS criteria, thus CPAP adherence was 77.0% which is comparable to the recent cloud-based CPAP adherence data in the US (72.6%).

Conclusion: CPAP adherence in this study was higher than in the real-world data in Japan. Our sleep health promotion of CPAP therapy in this company successfully increased CPAP adherence.

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0462

CPAP-EXPERIENCED PATIENT PERCEPTIONS OF CPAP & NOVEL NASOPHARYNGEAL AIRWAY DEVICE AS CPAP ALTERNATIVE FOR OBSTRUCTIVE SLEEP APNEA

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Introduction: Untreated obstructive sleep apnea (OSA) can impact numerous critical organ systems with drastic health ramifications while decreasing daily quality of life of individuals and their family. While Continuous Positive Airway Pressure (CPAP) can be highly effective, adherence is remarkably low. This is a preliminary initiative to gauge patient perceptions of a new non-surgical nasopharyngeal airway (NPA) device in development for OSA.

Methods: An IRB-approved single-site study surveyed 10 patients with polysomnography-confirmed OSA and at least 3 months’ experience using CPAP therapy. An independent expert in patient-reported outcomes helped develop the instrument to understand perceptions and attitudes towards CPAP and gauge initial reactions to the NPA-OSA device. This was reviewed by three Sleep Medicine experts for content validity. An NPA-OSA device description and insertion training video were provided to elicit feedback. Sixty-minute telephone interviews were conducted with OSA patients and transcribed by the independent expert.

Results: Ten patients (4 male), participated with an age range from 31 to 82 years. Nine used CPAP nightly, although described situations when they would not. All participants described significant dissatisfaction with some aspect of their CPAP treatment (e.g., restrictions on sleep position, difficulty cleaning and traveling, reliance on electricity), though most cope and appreciate therapeutic benefit. Respondents were motivated to find new treatment options for OSA, but were not actively seeking new options. Surgical treatment was considered by most, but with fear of unsuccessful outcomes/complications. A few of the respondents had previously used oral appliances with limited success. When introduced to the NPA device, most participants were interested in trying it. Positive

attributes were non-invasive, portable and not requiring electricity. Ultimately, participants believed that the device had the potential to improve sleep. Primary concerns were the potential of pain during insertion, discomfort during use, and treatment effectiveness. All those interviewed were interested in participating in a clinical trial using the device.

Conclusion: Patients successfully using CPAP may still be dissatisfied and motivated to explore new options. The NPA-OSA device was considered a compelling option.

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0463

DEEP LEARNING CLASSIFICATION OF FUTURE PAP ADHERENCE BASED ON CMS AND OTHER ADHERENCE CRITERIA

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Introduction: Improving positive airway pressure (PAP) adherence is crucial to sleep apnea therapy success. Although behavioral interventions may be deployed to increase PAP adherence, operationalization remains an ongoing clinical challenge. Treatment outcomes may be optimized by forecasting PAP use to identify patients at risk for non-adherence enabling early intervention. We build upon our previous work by leveraging a larger dataset, additional metadata, and new Deep Learning approaches to forecast future PAP adherence.

Methods: We collected a cohort of N=21,397 subjects with daily PAP usage recorded during 2015-2021. We defined the input to models as the number of minutes the PAP machine was used during each day for the first 30-days. The ground truth was defined as the PAP adherence of the patients at the 3-month, 6-month, and 1-year endpoints. Adherence was calculated based on a 30-day window as ≥ 4 -hours of usage for $\geq 70\%$ of nights. We evaluated a Deep Neural Network (DNN) model with 10-fold cross-validation to forecast future adherence by leveraging previous daily usage information. Results were compared to a naive method which assumes adherence at each time point equals adherence during the first 30-days.

Results: The DNN models predicted adherence with a sensitivity of 90%, 81%, 77% and a specificity of 90%, 81%, 77%, for 3-month, 6-month, and 1-year endpoints, with ROC-AUC values of 0.97, 0.89, and 0.84 respectively. The models converged to ROC-AUC performance >0.90 for the first 90-days within the first 7 to 14-days of PAP use.

Conclusion: DNN models demonstrated strong predictive performance for PAP adherence, as defined by the CMS adherence criteria, measured by sensitivity, specificity, and overall ROC-AUC results at clinically relevant 90-day, 6-month, and 1-year timepoints. AI approaches show promise as early predictors of the likelihood to meet key therapy utilization thresholds within the first 1-2 weeks of therapy, enabling early PAP intervention or transition to alternative therapies.

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0464

DEEP LEARNING TO PREDICT PAP ADHERENCE IN OBSTRUCTIVE SLEEP APNEA

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Introduction: Machine Learning (ML) algorithms to predict Positive Airway Pressure (PAP) adherence may support personalized clinical management. Models were developed to predict adherence at various time-points after PAP initiation and in moving time windows.

Methods: Deep neural network (DNN) models were trained utilizing daily PAP data (Kaiser Permanente, Southern California). The DNN was evaluated with 10-fold cross-validation on N=21,397 patients. Algorithms developed included (a) Models 1 and 2 which utilized early usage to predict adherence at 90-days and 1-year respectively, and (b) Model 3 which utilized 14 and 30-day moving windows to predict subsequent usage. Regression analyses compared ML and Naïve (i.e., future use equals previous use) predictions versus Actual adherence.

Results: Model 1 predicted “% days without usage” for first 90-days based on first 7, 14, 21, 30-days of input and at 1-year (90-day window) based on first 30, 60, 90, 180-days of input. ML was superior to Naïve in predicting adherence [R² for ML versus Naïve compared to Actuals for different input days—0.495-vs-0.193; 0.660-vs-0.465; 0.748-vs-0.607; 0.828-vs-0.735 at 90-days and 0.362-vs-0.104; 0.463-vs-0.247; 0.513-vs-0.339; 0.680-vs-0.547 at 1-year; all $p < 0.05$]. Model 2 predicted “hours/night” of use—ML did not outperform the Naïve prediction with similar R²; however, when ML predicted < 3 hours/night, nearly all patients had “no significant usage” at 1-year (comparatively, the naïve model had no differentiating threshold to predict this outcome.) Model 3 utilized different windows of PAP usage to predict subsequent usage. ML predictive accuracy was similar using 14 or 30-days of input [R² for ML vs. Actuals in predicting 7, 14, and 30-day “% days used ≥ 4 hours” were 0.687, 0.701, 0.699 using 14-days input and 0.582, 0.702, 0.77 using 30-days input; all $p < 0.05$].

Conclusion: ML algorithms based on PAP usage can predict future adherence, potentially supporting personalized treatment decisions and pre-emptive interventions when upcoming non-adherence is predicted.

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0465

DIFFICULTY INITIATING AND MAINTAINING SLEEP IS ASSOCIATED WITH INCREASED BLOOD PRESSURE IN PEOPLE WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Approximately 30-50% of people with obstructive sleep apnea (OSA) have difficulty initiating and/or maintaining

sleep (DIMS). The co-occurrence of OSA and DIMS is associated with worse mental health and quality of life compared to OSA alone. This study investigated potential associations between OSA and regular sleep disturbances (defined over multiple months) with blood pressure and hypertension.

Methods: A validated under-mattress sleep analyzer (WITHINGS) monitored sleep in 12,287 participants over ~6-months at home. The mean apnea-hypopnea index (AHI), sleep onset latency (SOL) and wake after sleep onset (WASO) were calculated over the recording period. OSA was defined as an average AHI ≥ 15 events/hour. DIMS was defined as an average SOL ≥ 30 min and/or WASO ≥ 45 min. Participants were categorized into those with neither condition (control), OSA-alone, DIMS-alone, and OSA+DIMS. Blood pressure measurements were recorded using a home monitor to define hypertension based on mean systolic blood pressure ≥ 140 mmHg and/or a mean diastolic blood pressure ≥ 90 mmHg. Associations between OSA+DIMS and hypertension were investigated using regression analyses controlled for age, sex, and BMI.

Results: Participants were middle-aged (Mean $\pm$ SD; 50 $\pm$ 12 y), mostly men (88%) and overweight (BMI; 28 $\pm$ 6 kg·m⁻²). The prevalence of DIMS-alone, OSA-alone and OSA+DIMS was 10%, 21% and 8%, respectively. OSA-alone was associated with (mean [95%CI]) 4.5 [4.1, 5.0] and 2.6 [2.3, 2.93] mmHg higher systolic and diastolic blood pressure values compared to control. OSA+DIMS was associated with a 5.9 [5.3, 6.6] and 3.7 [3.3, 4.2] mmHg difference compared to control, and the increased difference was greater than OSA-alone (systolic: +1.4 [0.8, 2.0]; diastolic: +1.12 [0.7, 1.6] mmHg; p-values < 0.001). Furthermore, OSA-alone and OSA+DIMS were associated with a 37 [22 to 54] and a 60 [36 to 88] % increase in hypertension prevalence compared to control, respectively. OSA+DIMS had a greater increase in hypertension prevalence (17% [-1 to 38%]) compared to OSA-alone.

Conclusion: OSA when combined with difficulties initiating and maintaining sleep, consistent with insomnia symptomatology, was associated with higher blood pressure and increased hypertension prevalence compared to OSA-alone.

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0466

EFFECT OF OBSTRUCTIVE SLEEP APNEA AND CPAP ON TELOMERE LENGTH AND ITS ASSOCIATED MECHANISMS

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Introduction: Growing evidence suggests the contribution of obstructive sleep apnea (OSA) in the molecular pathways of aging related to the maintenance of telomere length. The present study aimed to investigate the effect of OSA and its treatment with continuous positive airway pressure (CPAP) on the variation of telomere length and its associated mechanisms.

Methods: For this, a 6-month randomized, double-blind and sham-controlled clinical trial was conducted. Participants were randomized to CPAP or sham-CPAP and attended 7 visits, in which they underwent clinical assessment and had their blood collected to determine mean leukocyte telomere

length (LTL) and the dosage of metabolic and inflammatory markers.

Results: Among 127 individuals that we contacted, 46 met the inclusion criteria. At baseline, individuals in both groups were homogeneous, including LTL (p=0.106). Adherence during the intervention was 5.29 $\pm$ 1.09 in the sham-CPAP group and 5.71 $\pm$ 0.19 in the CPAP group. After 6 months of intervention, we observed a statistically significant effect of the treatment (p=0.001) on LTL, in which the sham-CPAP group (1.0117 $\pm$ 0.1552, 0.9457 $\pm$ 0.0747, 0.8482 $\pm$ 0.2163) showed a more significant reduction than the CPAP group (1.0960 $\pm$ 0.1122, 1.0521 $\pm$ 0.1094, 1.0675 $\pm$ 0.1225). Furthermore, we found a negative correlation between delta LTL and delta TNF- α at Visit 7 and Visit 1 (rho=-0.216, p=0.003) due to the sham-CPAP intervention (rho=-0.383, p=0.009) in relation to the use of CPAP (rho=0.021, p=0.800).

Conclusion: We can conclude that CPAP, when compared to sham-CPAP placebo, caused an effect on LTL stability, potentially by the modulation of TNF- α .

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0467

EFFECT OF TRANSORAL AWAKE STATE NEUROMUSCULAR STIMULATION THERAPY ON SLEEP EFFICIENCY IN PATIENTS WITH MILD OSA

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Introduction: Obstructive sleep apnea can cause fragmented sleep which decreases total sleep time thus decreasing sleep efficiency. Studies have shown improvement in sleep efficiency with the treatment and adherence to therapy for sleep apnea. Due to the CPAP shortage, alternative treatment options for sleep apnea have opted including Transoral awake state neuromuscular stimulation is a novel FDA-approved therapy for mild sleep apnea.

Methods: Transoral awake state neuromuscular stimulation device procured through the regulatory process at VA Minneapolis is offered to veterans with Mild OSA (AHI 5-15) on a home sleep study. A retrospective data analysis was done on the sleep efficiency of veterans who completed the initial 6 weeks of at least 20 minutes of daily followed by maintenance of 2 weeks of twice weekly use. Sleep efficiency was calculated by total sleep time divided by total recording time multiplied by 100.

Results: A total of 112 patients with mild OSA were offered devices as an alternative option for treatment during the period of December 2021 to August 2022. Of these, 22 veterans completed a post-therapy home sleep study. The average age of patients is 53.22 years (ranging from 27-75). The average mean sleep efficiency Pre-therapy was 78.86% (ranging from 62.55% - 95.29%) post-therapy was 82.97% (ranging from 63.52% - 92.23%) A paired t-test was obtained for sleep efficiency which showed a mean difference of 4.11% with a p-value of 0.150 which is statistically non-significant.

Conclusion: Sleep efficiency can be affected by multiple co-morbid conditions among veterans though our study did show a mean difference of 4.11% pre- and post-therapy it was not statistically

significant with a p-value of 0.150 that could be related to the small sample size. We proposed that to evaluate sleep efficiency a large sample size is needed with no other co-morbid conditions which can affect sleep efficiency.

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0468

EFFECTS OF APNEA-INDUCED SWS DISRUPTION WITH AND WITHOUT SUPPLEMENTAL OXYGEN ON OVERNIGHT SPATIAL MEMORY IN CPAP-TREATED OSA

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Introduction: Sleep disturbance from obstructive sleep apnea (OSA) impairs overnight memory processing. This may be mediated by changes to slow wave sleep (SWS) as less slow wave activity (SWA) is associated with worse overnight spatial and declarative memory. We developed a within-subjects model of SWS-specific CPAP-withdrawal to create 3 polysomnologically (PSG)-verified conditions of 1) stable-SWS on CPAP, 2) SWS-fragmentation with intermittent hypoxemia (OSAsws), and 3) SWS-fragmentation with reduced hypoxemia (OSAsws+O2). Using these conditions, we sought to dissociate effects of SWS disruption and intermittent hypoxemia on overnight spatial navigational memory.

Methods: We included 33 patients (7 female, average age 54yrs) with moderate-to-severe OSA (AHI4%>20/hr) who were CPAP-treatment adherent. During each PSG visit, they explored one of three 3D maze environments, performing 3 timed trials before and after each of 3 randomized and counterbalanced SWS disruption conditions [1)CPAP, 2)OSASWS & 3)OSASWS+O2]. %SWS, OSA severity during SWS, frontal SWA(0.5-4 Hz), and overnight change in maze completion times were compared according to PSG condition using Friedman Rank Sum and Conover's tests. The relationship between SWA and maze performance was tested using Pearson correlation coefficient.

Results: %SWS was significantly greater during CPAP compared to CPAP-withdrawal conditions (CPAP=17.2%, OSAsws=13.3%, OSAsws+O2=13.8%, $p<0.02$). Apnea hypopnea index (AHI3A) in SWS during CPAP-withdrawal was significantly greater compared to CPAP (CPAP=0/hr, OSAsws=24.4/hr, OSAsws+O2=19.3/hr, $p<0.00001$). Hypoxic burden in SWS was significantly reduced in the OSAsws+O2 condition vs OSAsws (23 %min/hr vs 37 %min/hr, $p<0.001$). No significant differences were observed between the three conditions for SWA or overnight change in maze completion times. When including all PSG visits, greater SWA was significantly associated with better overnight maze improvements ($R=0.28, p<0.01$) which approached significance for the CPAP condition in isolation ($R=0.33, p=0.068$).

Conclusion: SWS-specific CPAP-withdrawal resulted in recurrence of mild OSA in SWS; supplemental oxygen reduced the hypoxic burden, but SWA did not differ between OSA with hypoxemia and without. There was, however, an overall positive relationship between SWA and maze performance. These observations suggest that the effect on spatial navigation of hypoxia in OSA is mediated by disruption of SWA.

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0469

EFFICACY OF IN-PERSON VS TELEHEALTH POSITIVE AIRWAY SET-UP IN VETERANS

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Introduction: The SARS-CoV-2 pandemic necessitated a transition to sleep telehealth, including for positive airway pressure (PAP) set up. Prior to this change, the standard of care for initiation of PAP therapy included a face-to-face visit with education. This study sought to evaluate whether telehealth set-up was non-inferior to in-person set-up for veterans initiating PAP therapy.

Methods: VA patients were identified through prosthetic inventory package orders at two large VA systems. The telehealth PAP set-ups occurred between March, 2020 and December 2021. The in-person PAP set ups occurred between January and December, 2019. PAP data was extracted for days 1-30 (month 1) and 60-90 (month 3). PAP use was compared between in-person and tele-medicine utilizing hours used per night, days used (out of 30 days), and residual AHI (among compliant users). Non-inferiority analyses were performed, using the following non-inferiority margins: 45 minutes for hours used, 4 days for days of usage, and 5 events per hour for residual AHI.

Results: 432 VA patients (93.5% male) who underwent PAP set up were included (224 in person; 208 telehealth). Average age and BMI (SD) were 55.9±15.8 years and 31.9±5.6. Race and ethnicity identification was 60.7% White; 15.7% Black; 6.9% Asian and 15.5% Hispanic/Latino. 76.2% of participants resided in urban locations. Non-inferiority was established for PAP usage at month 1 (90% CI=-0.31,0.53) and month 3 (90% CI=-0.18, 0.71), days used at month 1 (90% CI=-2.28, 1.33) and month 3 (90% CI=-1.75, 2.20), and residual AHI at month 1 (90% CI=-0.40, 1.62) and month 3 (90% CI=-0.69, 2.30).

Conclusion: Initiation of PAP therapy via telehealth was non-inferior to in-person set up visits in terms of PAP adherence among Veterans who use VA care. Findings suggest that veteran preference and structural factors should be considered in determining which approach is most appropriate for a given patient.

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0470

FACTORS ASSOCIATED WITH DISCORDANT INITIAL HOME SLEEP APNEA TESTING AND POLYSOMNOGRAPHY

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Introduction: Nocturnal polysomnography (PSG) is the gold standard for diagnosing obstructive sleep apnea (OSA). Home sleep apnea tests (HSAT) have been incorporated in the diagnostic algorithm in patients with a high pre-test suspicion of OSA. While many studies have compared HSATs with PSGs, it is not well understood what factors may be responsible for inconclusive HSAT results.

Methods: We performed a retrospective chart review of adult patients who underwent a non-diagnostic HSAT evaluation, who subsequently tested positive for OSA (on PSG) between 1/1/2022 and 11/1/2022. We collected demographic and sleep study data. Patients who did not have a follow up PSG were excluded.

Results: A total of 20 patients were reviewed. 80% had a negative HSAT with a positive subsequent PSG. The average age was 33.9 years (SD +/- 11.3 years). 43% were male and 50% were Caucasian. The average BMI was 29 kg/m² (SD +/- 5.3 kg/m²). The average Epworth Sleepiness Scale score (ESS) was 8 (median 6.5) with only 31% reporting an ESS >10. The average HSAT recording time was 449.1 minutes. The average respiratory disturbance index (RDI) on the follow up PSG was 17.7 events/hour of sleep (SD +/- 12). Only 1 patient was diagnosed with severe OSA. 38% were diagnosed with anxiety in this cohort. Other co-morbidities were insignificant. Of all the HSATs performed, 40% were denied for an initial PSG evaluation and converted to an HSAT evaluation.

Conclusion: HSATs are validated in patients with a high pretest probability of OSA. Anxiety was found in one third of patients included (possibly contributing to a negative initial HSAT). Patient demographics however were also not remarkable for a high risk of OSA in this group (e.g. non-obese, < 55 years, female). The subsequent diagnosis for OSA was also only mild or moderate (93.8%) in this lower risk cohort. Hence, another explanation for the initial negative HSAT evaluation may have been the insurance denial of the initial PSG request (40%). Denials of low risk patients for PSG may contribute to a misuse of resources. We also need to educate referring physicians to follow appropriate HSAT ordering criteria (based on high OSA risk factors).

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0471

HAVING A SURGICAL AORTIC VALVE REPLACEMENT? YOU VERY LIKELY HAVE OBSTRUCTIVE SLEEP APNEA.

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Introduction: Patients with advanced aortic stenosis (AS) have a high risk of sleep-related breathing disorders (SRBD), yet prior research is limited to type III sleep apnea tests. Whereas the American Academy of Sleep Medicine recommends polysomnography for SRBD diagnosis in patients with significant cardiorespiratory disease, unattended studies are often more acceptable, especially to surgical candidates. We conducted this

study to address the need for comprehensive sleep testing in patients with advanced AS.

Methods: We conducted unattended type II sleep tests in 23 adults aged 50 and older scheduled for surgical aortic valve replacement (SAVR) and not using positive airway pressure. We obtained demographics and medical history and administered Clinical Dementia Rating, Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale, and 9-item Patient Health Questionnaire. We characterize this pre-surgical sample and report SRBD prevalence.

Results: Average age of the sample was 68.3 ± 7.2 (mean ± SD), and 74% were male. Charlson comorbidity index was 2.0 ± 2.0. Three (13%) had a global CDR of 0.5, consistent with mild cognitive impairment. Mean PSQI scores were 7.0 ± 3.6, ESS 6.7 ± 4.0, and PHQ-9 4.6 ± 5.3. No subject had an AHI < 5: 7 had a score of 5–14, 8 of 15–29, and 8 of 30 or greater. Mean obstructive AHI was 25.3 ± 20.7, central AHI 1.9 ± 3.4, and respiratory arousal index 8.7 ± 6.2. Total sleep time 362.7 ± 82.6 min with sleep efficiency of 82.1% ± 8.6%. Sleep stage data to be presented.

Conclusion: All subjects in this sample not using positive airway pressure had an AHI ≥ 5. Sixteen subjects (70%) had an AHI ≥ 15, indicating moderate to severe sleep apnea due to predominantly obstructive events. These results strongly suggest that patients with severe AS, especially those undergoing SAVR, would benefit from evaluation for SRBD.

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0472

INSOMNIAS IN OSA PATIENTS WITH DIFERENT DEGREES OF SEVERITY: A STEP TOWARDS PHENOTYPING COMISA

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Introduction: With this pilot study, authors aimed to find how OSA and insomnias (sleep onset and maintenance insomnia) interact.

Methods: Data from PSG-level 1 consecutive Obstructive Sleep Apnea (OSA) patients were retrospectively collected. Insomnia and OSA severity were assessed. Arousals (A), arousal index (AI), wakefulness after sleep onset (WASO), total sleep time (TST) and sleep efficiency (SE) were used to better characterize insomnias. Epworth Sleepiness Scale (ESS) was used to assess excessive daytime sleepiness (EDS).

Results: From 87 OSA patients, 43 (51.8 %): 53.5 % being females (F), where insomniacs (COMISA). Patients with COMISA were distributed as follows: Mild OSA (5 F: 22%; BMI=26.9±4.0 Kg/m²; Age=50.3±15.8 years old - yo; AHI=15.9±13.3 ev/h; ODI3%=4.0±3.9 ev/h; SaO₂mean=96.4±0.98 %; SaO₂min=89.5±4.2 %) with a TST of 414.5±70.9 min, SE=79.6±13.6 %, WASO=83.7±57.0 min and 182.7±84.8 arousals (AI=26.6±11.1 ev/h); Moderate OSA (8 F: 35%; BMI=28.7±4.7 Kg/m²; Age=53.5±13.4 yo; AHI=24.4±3.1 ev/h; ODI3%=8.8±5.7

ev/h; $\text{SAO}_2\text{mean}=95.3\pm1.2\%$; $\text{SaO}_2\text{min}=87.7\pm3.9\%$) with a $\text{TTS}=385.8\pm69.2$ min, $\text{SE}=80.7\pm12.6\%$, $\text{WASO}=81.4\pm62.3$ min and 178.8 ± 69.5 arousals ($\text{AI}=27.5\pm8.9$ ev/h); Severe OSA (10 F: 43%; $\text{BMI}=30\pm5.2$ Kg/m²; $\text{Age}=58.6\pm7.8$ yo; $\text{AHI}=48.1\pm19.9$ ev/h; $\text{ODI}_3\%=25.4\pm25.1$ ev/h; $\text{SaO}_2\text{mean}=94.5\pm2.4\%$; $\text{SaO}_2\text{min}=82.6\pm10\%$) had a $\text{TTS}=386.5\pm64.5$ min, $\text{SE}=77.4\pm11.4\%$, $\text{WASO}=93.3\pm49.8$ min and 274.2 ± 95.3 arousals ($\text{AI}=42.6\pm12.9$ ev/h). The others 40:48.2% presented with Isolated OSA: Mild OSA (7 F: 39%; $\text{BMI}=27.8\pm3.9$ Kg/m²; $\text{Age}=48.3\pm12.1$ years old - yo; $\text{AHI}=8.9\pm3.2$ ev/h; $\text{ODI}_3\%=2.5\pm2.7$ ev/h; $\text{SaO}_2\text{mean}=96.4\pm0.8\%$; $\text{SaO}_2\text{min}=90.8\pm2.6\%$) had a $\text{TTS}=423.9\pm36.7$ min, $\text{SE}=86.4\pm7.3\%$, $\text{WASO}=58.1\pm27.2$ min and 151.6 ± 42.1 arousals ($\text{AI}=21.6\pm6.5$ ev/h); Moderate OSA (7 F: 39%; $\text{BMI}=27.1\pm5.4$ Kg/m²; $\text{Age}=53\pm13.1$ yo; $\text{AHI}=21.2\pm3.8$ ev/h; $\text{ODI}_3\%=6.9\pm3.8$ ev/h; $\text{SAO}_2\text{mean}=95.9\pm0.6\%$; $\text{SaO}_2\text{min}=86.7\pm4.1\%$) had a $\text{TTS}=406.3\pm86.5$ min, $\text{SE}=79.4\pm15.2\%$, $\text{WASO}=77.2\pm68$ min and 196.3 ± 60.4 arousals ($\text{AI}=29.1\pm6.6$ ev/h); Severe OSA (4 F: 22%; $\text{BMI}=28.3\pm4.2$ Kg/m²; $\text{Age}=62\pm12.5$ yo; $\text{AHI}=51.8\pm18.7$ ev/h; $\text{ODI}_3\%=28.5\pm21.2$ ev/h; $\text{SaO}_2\text{mean}=93.9\pm3.5\%$; $\text{SaO}_2\text{min}=81.4\pm10.2\%$) had a $\text{TTS}=385.9\pm105.7$ min, $\text{SE}=76.2\pm20.1\%$, $\text{WASO}=92.9\pm80.1$ min and 272.7 ± 115.6 arousals ($\text{AI}=42.5\pm14.9$ ev/h). ESS was 10.1 ± 7.9 , 9 ± 5.4 and 8 ± 5.7 for the Mild, Moderate and Severe OSA in COMISA group, and 14.6 ± 7.3 , 10.9 ± 5.2 and 5.9 ± 5.2 , for the mild, moderate and severe forms of the isolated OSA group.

Conclusion: Insomnia complaints in OSA patients and PSG correlates seems to indicate clinically relevant COMISA phenotypes that would help to better characterize and manage this condition at different degrees of OSA severity.

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0473

MULTI-OUTCOME OF MANDIBULAR ADVANCEMENT DEVICE IN OBSTRUCTIVE SLEEP APNEA WITH DIFFERENT POLYSOMNOGRAPHIC PHENOTYPE

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Introduction: The association of mandibular advancement device (MAD) treatment response and polysomnographic phenotype in patients with obstructive sleep apnea (OSA) has not been fully elucidated. We hypothesized MAD response would be associated with two polysomnographic phenotypes, including sleep stage and positional dependency in treatment-naïve patients with moderate-severe obstructive OSA.

Methods: This retrospective study recruited OSA patients with $\text{AHI}\geq 15/\text{h}$, aged 20 to 80, treatment naïve, and received MAD treatment for more than three months. Positional phenotype included supine predominant (supine-p) and non-positional OSA. Sleep stage phenotype included REM-predominant (REM-p), NREM-predominant (NREM-p), and stage-independent (SI) OSA. MAD response was defined as criterion 1: residual $\text{AHI}< 5/\text{h}$ with $>50\%$ reduction, and criterion 2: residual $\text{AHI}< 10/\text{h}$ with $>50\%$ reduction. Outcomes included the change in PSG parameters, habitual latency of sleep onset and sleep hour, Epworth sleepiness scale, excessive daytime sleepiness,

depression, physical, vitality and mental health domain of SF-36, and in-lab bedtime and wake blood pressure (BP).

Results: 379 patients with median age of 52.2 years, BMI of 26 kg/m², 78.1% of men, and AHI of 28.2/h were recruited. Supine-p and REM-p OSA had lower baseline AHI and desaturation. The overall response rate were 34.7% (criterion 1) and 56% (Criterion 2). Supine-p OSA had higher response rate than non-positional OSA (criterion 1: 42.2% vs. 20.3%; criterion 2: 64.3% vs. 32.5%), while NREM-p OSA had lower response rate than REM-p and SI (REM-p vs. NREM-p vs. SI: criterion 1: 43.9% vs. 9.7% vs. 34.2%; criterion 2: 54.5% vs. 41.9% vs. 53.3%). Despite the more reduction in AHI, desaturation, and arousal in responders, there was no differences in change of ESS, EDS, sleep pattern, depression, SF 36 domain, and BP between responders and non-responders which remained unchanged after stratified with sleep stage and position phenotypes.

Conclusion: Non-positional and NREM-predominant OSA had lower responses rate to MAD treatment. There were no differences in non-breathing outcomes between responders and non-responders regardless of sleep stage and positional phenotype.

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0474

OBSERVING THE CHANGES OF TONGUE AND AIRWAY CONFIGURATIONS IN RESPONDERS OF MANDIBULAR ADVANCEMENT DEVICE USING ULTRASOUND IMAGING

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Introduction: Mandibular advancement device (MAD) is designed to pull the mandible and the tongue forward anteriorly to increase the cross-sectional airway dimension and thus possibly reduce airway obstructions during sleep. The effectiveness of a MAD may be affected by the pre-treatment OSA severity, BMI, and degree of changes in pharyngeal dimensions resulting from the device in situ. In this study, 3D submental ultrasound imaging is applied to evaluate the difference in the tongue and airway configurations between the responders and non-responders of the MAD treatment.

Methods: In this retrospective study, 31 subjects (25 males, median age/BMI/baseline AHI of 56/24.5/25.3) diagnosed with sleep apnea and underwent tongue-backing-MAD (t-MAD) treatment were consented from the Department of dentistry of National Taiwan University Hospital between April and December 2022 (IRB 202108078RIPD). Changes in the severity of OSA were assessed with polysomnographic studies. Success of t-MAD treatment was defined by an AHI of less than 10 events/hour and at least 50% decrease in AHI from baseline. There were no significant differences in age, BMI, gender and baseline AHI between responders (17) and non-responders (14). While awake and lying in supine position, the tongue and airway configurations at retropalatal and retroglossal regions without and with t-MAD in situ were assessed with standardized

3D submental ultrasound imaging (AmCAD BioMed Corp., Taiwan). Statistical comparisons were performed using t-tests, chi-square tests and nonparametric Mann-Whitney tests.

Results: The anteroposterior location of the tongue-airway interface at retroglossal region, relative to the superior-inferior location of the soft-palate-airway interface, was found significantly reduced in responders when t-MAD is in situ ($p = 0.0078$). 13 responders (76.5%) and 9 non-responders (64.3%) were observed with airway width increase in the retroglossal region with t-MAD in situ. However, the difference in airway width changes between responders and non-responders was not statistically significant possibly due to the limited sample size.

Conclusion: With the real-time visualization and quantitative characterization of the tongue and airway configurations, the 3D submental ultrasound with standardized imaging protocol is able to differentiate the responders from non-responders of the t-MAD treatment and could be a potential tool for treatment response evaluation.

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0475

OPTIMAL THRESHOLDS FOR SPLIT-NIGHT POLYSOMNOGRAPHY WITH TRANSITIONS IN LABORATORY HYPOPNEA SCORING CRITERIA

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Introduction: Performance of split-night polysomnography, the application and titration of positive airway pressure (PAP) therapy after an initial diagnostic interval, is a common practice in clinical sleep medicine. There is no currently recommended apnea-hypopnea index (AHI) threshold at which PAP should be applied during polysomnography. Differences in American Academy of Sleep Medicine (AASM) and Centers for Medicare and Medicaid Services (CMS) hypopnea scoring criteria and limitations on real-time hypopnea classification complicates identification of an optimal split-night threshold. Of particular concern is that patients may be “split” under AASM hypopnea rules but have insufficiently severe sleep disordered breathing under CMS rules to be diagnosed or treated appropriately. This study aimed to clarify optimal AHI thresholds for split night polysomnography in the context of a laboratory-wide transition from CMS to AASM hypopnea scoring criteria.

Methods: Effective October 1, 2021, our laboratory transitioned solely to scoring AASM-defined hypopneas, with additional post hoc identification of CMS hypopneas for reporting purposes. With this change, the split-night threshold was changed from 15 to 30/hr. All diagnostic polysomnograms (without PAP therapy) performed on adult patients through October 31, 2022, were retrospectively analyzed to clarify the effect of changing hypopnea scoring criteria in this context.

Results: 634 diagnostic polysomnograms were analyzed. An AHI threshold of 15/hr (using AASM hypopnea criteria) in the first two hours of sleep with at least 3 hours of time remaining for PAP titration would have resulted in 96 additional patients receiving treatment with PAP therapy. Among these, only one (1.04%) had CMS AHI below 5/hr. Sixty-eight of these patients had CMS AHI 5-15/hr during the first two hours of sleep. Among these, only eight patients did not have an additional comorbidity or symptom profile under CMS guidelines making them eligible

for PAP therapy, however, none had CMS AHI >15/hr when the full night of sleep was analyzed.

Conclusion: Our study suggests there is little need to raise the split-night threshold when transitioning from CMS to AASM hypopnea criteria, and doing so substantially reduces the number of patients treated with PAP therapy in the sleep laboratory.

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0476

PERIPHERAL ARTERIAL TONOMETRY-BASED HOME SLEEP APNEA TEST VS. POLYSOMNOGRAPHY IN DETECTION OF CENTRAL DISORDERED BREATHING EVENTS

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Introduction: In-laboratory polysomnography (PSG) is the gold standard diagnostic test for sleep-disordered breathing (SDB). WatchPAT® is a type of home sleep apnea testing (HSAT) that utilizes peripheral arterial tone (PAT) signals and other sensors to evaluate for SDB. There is an abundance of data to support the use of a PAT-based HSAT for obstructive sleep apnea (OSA), though data to support its use in central sleep apnea (CSA) in the general population undergoing PSG is lacking. We therefore aimed to compare the agreement of a PAT-based HSAT and PSG in detecting central disordered breathing events in the general population undergoing PSG.

Methods: A prospective cross-sectional study was conducted in eligible adult participants with suspected sleep apnea who were scheduled to undergo diagnostic or split-night PSG at the Center for Sleep Medicine at Mayo Clinic in Rochester, MN, between May 2021 and October 2022. The PAT-based HSAT was applied during the night of PSG to obtain simultaneous recording. Subjects were excluded if they had chronic atrial fibrillation, permanent pacemaker, or finger deformity precluding finger probe use or if they were on alpha- antagonists or short-acting nitrates. The PAT-based HSAT data were automatically scored with the use of proprietary software, and the PSG data were manually scored by registered polysomnography technologists. All studies were reviewed by board-certified sleep medicine providers.

Results: A total of 147 subjects (53% female) were included in the final analysis after excluding 18 subjects due to malfunction of the PAT-based HSAT. The subjects had a mean age of 58 ± 15 yrs and BMI of 34 ± 9 kg/m². 95 (65%) subjects underwent split-night studies. OSA was diagnosed in 81% with a mean PSG AHI of 28 ± 27 events per hour. CSA was diagnosed in 3% of subjects with a mean PSG AHI of 33 ± 27 events per hour. Of the total 2120 central disordered breathing events reported by the PAT-based HSAT (mean pAHIc 3 ± 5 events per hour), 365 (17%) correlated with central apneas and 78 (3.7%) correlated with central hypopneas found on PSG.

Conclusion: In our prospective study, the PAT-based HSAT demonstrated low positive predictive value in detecting central disordered breathing events when compared to PSG.

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0477

POSITIVE AIRWAY PRESSURE THERAPY AND ANTIDEPRESSANT MEDICATION ADHERENCE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA AND DEPRESSION*Kimberly Sterling¹, R Benjamin Dexter², Jean-Louis Pépin³, Kate Cole¹, Emerson Wickwire⁴*¹ ResMed Science Center, ² ResMed Science Centre, ³ HP² Laboratory, Inserm U¹³⁰⁰, University Grenoble Alpes, Grenoble, FRANCE, ⁴ University of Maryland

Introduction: Previous studies have shown that treatment of obstructive sleep apnea (OSA) with positive airway pressure (PAP) therapy in patients with OSA and comorbid depression may improve response to antidepressant medication therapy. At the same time, scant evidence has examined the impact of medication and PAP adherence in patients with OSA and comorbid depression. Patients that adhere to one therapy may be more likely to adhere to other therapies or healthy behaviors in a so-called “healthy user effect.” This retrospective study investigated the association between antidepressant medication adherence and PAP therapy adherence in patients with newly diagnosed OSA and comorbid depression.

Methods: Our data source was a national sample of administrative claims data linked to objective PAP therapy usage. Included patients either had two healthcare encounters or one hospitalization with a depression ICD-10 diagnosis code the year prior to being diagnosed with OSA and initiated on PAP therapy. Adherence to antidepressant medication was defined as $\geq 80\%$ of proportion of days covered (PDC), and non-adherence was defined as $< 80\%$ PDC within a 180-day exposure window during the year prior to starting PAP therapy. Adherence to PAP therapy was categorized as consistently adherent, intermediately adherent, or not adherent based on objective usage over 2 years.

Results: 36,668 patients with OSA and comorbid depression were included. 27% were classified as consistently adherent, 45% intermediately adherent, and 28% non-adherent to PAP therapy. 68.6% of patients used antidepressant medication in the year prior to PAP initiation. 67.7% used a selective serotonin reuptake inhibitor, 43.8% atypical antidepressants, 32.1% serotonin and norepinephrine reuptake inhibitor, 10.7% tricyclic antidepressant, and 0.1% monoamine oxidase inhibitor. Relative to patients not adherent to antidepressant medication (22.2% consistently adherent, 43.8% intermediately adherent, 33.9% not adherent), those adherent to antidepressant medication in the year prior were also more adherent to PAP therapy over 2 years (29.2% consistently adherent, 45.2% intermediately adherent, 25.6% not adherent).

Conclusion: Patients that were adherent to antidepressant medication in the year prior to starting PAP therapy have slightly better adherence to PAP therapy over 2 years. In real-world studies, medication adherence may be an important confounder to adjust for when comparing patient outcomes.

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0478

PRE-TEST PROBABILITY OF OSA BASED ON SUBJECTIVE QUESTIONNAIRES CAN INDICATE WHO WILL BENEFIT THE MOST FROM A TYPE II STUDY*Veronica Guadagni¹, Amy Bender¹*¹ Cerebra

Introduction: Type III home sleep apnea tests have become increasingly popular due to reduced cost and convenience. However, previous research has reported limitations in their diagnostic accuracy. In this study, we assessed which individuals would benefit the most from a Type II home-PSG study when the only information available to clinicians were answers to subjective questionnaires.

Methods: We analyzed responses to a custom sleep survey from 510 participants (age 46.2 ± 12.4 ; 229 females). We entered 13 outcomes to a principal component analysis (PCA). These included age, body mass index (BMI), Epworth sleepiness scale (ESS) scores, sex, questions about snoring, subjective hours of sleep, satisfaction with own sleep, movement symptoms, problems falling asleep, staying asleep and waking up early. Based on the correlations between the original outcomes, the PCA extracted 3 factors that were interpreted as 3 different phenotypes: i) insomnia (e.g., sleep initiation and maintenance complaints, satisfaction with sleep, lower subjective sleep duration); ii) OSA (e.g., bed partner snoring complaints, snoring self-awareness, sleepiness, respiratory complaints); iii) movement disorder (e.g., movements, female, lower age, higher BMI). We then computed the pre-test probability of OSA (factor 2 scores $> 80\%$) and conducted a series of ROC analyses to assess specificity of the AHI in the same patient from both Type II and a simulated Type III (with EEG channels removed), RDI, and ORP metrics.

Results: The AUC values assessing the ability to predict 80% pre-test probability of OSA were: AHI Type II (0.734), AHI Type III (0.672), RDI (0.729), ORPNREM (0.622) and ORPTRT (0.543). The clinically used cut-off of 15 for the AHI Type II correctly classified 83% of patients with 47% probability of false positives, while the same cut-off for Type III correctly classified 43% of patients with 33% probability of false positives.

Conclusion: AHI Type II tests had the highest sensitivity in detecting OSA despite someone having $> 80\%$ pretest probability. This may be due to the characterization of hypopneas, respiratory effort related arousals, and total sleep time versus total recording time. These analyses indicate the superiority of Type II studies and indices that involve EEG signals to accurately detect OSA in patients with high pretest probability.

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0479

PREVALENCE, CLINICAL FEATURES, AND IMPACT OF LOW RESPIRATORY AROUSAL THRESHOLD ON PATIENTS WITH HYPOGLOSSAL NERVE STIMULATION*Sachin Shah¹, Shalini Manchanda¹, Stephanie Stahl¹,**Fahad Hasnain², Jaimin Patel³, Tarek Dabboussi¹, Noah Parker⁴*

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Introduction: This study aims to explore the prevalence and clinical features associated with low respiratory arousal threshold (ArTH) amongst patients with hypoglossal nerve stimulation (HNS) for the treatment of obstructive sleep apnea (OSA) and the possible effects it has on HNS adherence and device usage between time of activation and 1-year post-activation.

Methods: Following institutional review board approval, consecutive patients who underwent HNS system implantation were retrospectively studied, including clinical characteristics, diagnostic polysomnography (PSG) or home sleep apnea test (HSAT) and HNS post-implant data. Inclusion criteria were patients with ≥ 1 year of HNS usage who had also completed a post-implant HNS PSG titration study.

Results: Forty-five patients met inclusion criteria. Low ArTH was present in 44.4% of patients and compared to those with high ArTH, low ArTH had a higher prevalence of restless leg syndrome (RLS) (45% vs 12%, $p < 0.05$) and depression (60% vs 28%, $p < 0.05$). Low ArTH exhibited a trend toward shorter diagnostic total sleep time (TST) (295.0 vs 373.3 minutes, $0.05 < p < 0.1$). Bivalent logistic regression indicated the odds of having low ArTH is 8.6 times greater in patients with RLS (OR 8.6, CI 1.1 – 68.6, $p < 0.05$). Across all time points, low ArTH resulted in lower mean percentage of HNS nights used (92% vs 86%, $p < 0.001$) and a lower HNS amplitude (2.41 V vs 1.96 V, $p < 0.001$) and demonstrated a trend towards lower percentage of nights used ≥ 4 hours (72.9% vs 66.1%, $0.05 < p < 0.1$). 1-year post activation, low ArTH patients continued to show lower percentage of HNS nights used (89.8% vs 75.6%, $p < 0.01$) and a lower HNS amplitude (2.3 V vs 1.9 V, $p < 0.01$).

Conclusion: Low ArTH was highly prevalent amongst patients with OSA treated with HNS and was more frequently associated in patients with RLS. Patients with a low ArTH demonstrated significantly lower percentage of nights used and lower amplitudes, indicating the importance this particular phenotype may play in patient compliance with HNS. These findings could help better select candidates who will tolerate HNS therapy and develop targeted therapies to improve long-term adherence.

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0480

PSYCHOACTIVE SUBSTANCE USE AND SLEEP CHARACTERISTICS AMONG INDIVIDUALS WITH UNTREATED OBSTRUCTIVE SLEEP APNEA*Alexander Walker¹, Stephen Baldassarri¹, Jen-hwa Chu¹,**Annan Deng¹, Zhichao Xu¹, Reagan Blohowiak¹, Sean Byrne¹,**Clete Kushida², H. Yaggi³, Andrey Zinchuk⁴*

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Introduction: Obstructive sleep apnea (OSA) is characterized by recurrent airway obstruction causing intermittent hypoxia, arousal from sleep, and autonomic instability, and is associated with a variety of long-term health sequelae. The fragmented sleep resulting from these respiratory events leads to disruption in normal sleep architecture and progression to deeper stages of sleep, a potential mediator for some of the functional and neurocognitive impairments seen in this population. Similarly, psychoactive substance use (i.e., nicotine, alcohol, and caffeine) impacts sleep architecture in healthy individuals, but their effects in those with OSA have not been well described. We aimed to describe the association between psychoactive substance use and sleep characteristics and daytime symptoms in individuals with untreated OSA.

Methods: We performed a secondary, cross-sectional analysis of The Apnea Positive Pressure Long-term Efficacy Study (APPLES). Exposures included current smoking, alcohol, and caffeine use in individuals with untreated OSA. Outcome domains included subjective and objective sleep characteristics, daytime symptoms, and co-morbid conditions. Linear or logistic regression assessed the association between substance use and each domain (e.g., self-reported sleep duration, total polysomnographic sleep time, sleepiness, and anxiety).

Results: Of the 919 individuals with untreated OSA, 116 (12.6%) were current cigarette smokers, 585 (63.7%) were moderate or heavy alcohol users, and 769 (83.7%) were moderate or heavy caffeine users. Current smokers exhibited lower sleep duration (0.3 hours) and longer sleep latency (5 minutes) compared with non-smokers (all p -values < 0.05). REM sleep increased in those with moderate and heavy alcohol use (2.5 and 5% of total sleep time respectively), and moderate caffeine use (2%, all p -values < 0.05). The combined smoker plus caffeine group exhibited shorter sleep duration (0.4 hours) and higher risk for chronic pain [Odds Ratio (95%CI) = 4.83 (1.57, 14.9)].

Conclusion: Both psychoactive substances and untreated OSA impact normal sleep architecture, their cumulative effect may have clinical implications in this subgroup. Stimulating or sedating substances may be used in OSA patients to mitigate daytime and nighttime symptoms respectively. Further investigation into the effects substances have on this population may present opportunities to better understand disease mechanisms and increase the effectiveness of treatment in OSA

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0481

SEX DIFFERENCES IN MODERATE-SEVERE OBSTRUCTIVE SLEEP APNEA DIAGNOSIS USING DIFFERENT SLEEP STUDY MODALITIES

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Introduction: Male sex is a risk factor for obstructive sleep apnea (OSA). However, because men have been historically described as more vulnerable towards developing OSA, definitions of severity have been based mostly on male-specific pathophysiology. This study aimed to describe sex differences in referral patterns of diagnostic sleep study modalities (in-lab polysomnography [PSG], home sleep apnea tests [HST]) and their results as they related to OSA severity.

Methods: We defined a clinical cohort of individuals that underwent diagnostic sleep testing at the University of Kansas Health System Sleep Disorders Center between 2012-2021. We determined the association between sex and moderate-severe OSA (as compared to no or mild OSA) separately for individuals that underwent HST and PSG, in logistic regression models adjusted for age, body mass index (BMI) and Epworth sleepiness scale (ESS) scores. A complementary analysis stratified by age groups (< 35, 35-50, 50-65, ≥65 years) was also conducted.

Results: A total of 10,357 participants were included in this analysis (5,428 women [52.4%]; 53.0 [14.4] years; BMI=34.0 [16.1] kg/m²). Individuals that underwent HST were younger, more likely to be men, had higher BMI, lower ESS scores, and more severe OSA. Men were more likely to be diagnosed with moderate-severe OSA in both modalities, however higher odds were observed in those diagnosed using HST (ORHST [95%CI] = 2.86 [2.52-3.25]) than in those diagnosed using PSG (ORPSG [95%CI] = 2.48 [2.09-2.95]). Further disparities were observed among those with < 35 years, where men had a 4-fold increase in the odds of a moderate-severe OSA diagnosis than women in a HST (ORHST [95%CI] = 4.10 [2.59-6.50]) and only a 2.5-fold increase in the odds in a PSG (ORPSG [95%CI] = 2.48 [1.13-5.45]).

Conclusion: As expected, men are more likely than women to receive a diagnosis of moderate-severe OSA, however the effects were stronger in those diagnosed with HSTs as compared to PSGs, particularly at younger ages. These results suggest that potential sex inequalities in diagnosis and determination of OSA severity may be influenced by the choice of diagnostic sleep study modality, particular in younger women.

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0482

SLEEP APNEA DIAGNOSIS DISPARITIES FROM SERIOUS MENTAL ILLNESS IN A VETERAN COHORT

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Introduction: Sleep apnea (SA) diagnosis requires multiple steps including an office visit and testing. People with serious mental

illness (SMI) may require a longer time from referral to diagnosis and be less likely to complete the full diagnostic pathway because of functional limitations.

Methods: A retrospective cohort of VA Northeast Ohio Healthcare System Veterans referred for sleep medicine consultation (1/1/2010-12/31/2020). Dates of consultation, sleep clinic visits, and testing was collected in addition to demographics, past medical history, and medications at the time of initial consultation. SMI was defined as a composite of schizophrenia, schizoaffective disorder, and bipolar diagnosed disorder before the initial consultation. The outcome was defined as the time until fulfilling minimal SA diagnostic pathway defined as completing both a sleep clinic appointment and at least one sleep test. Relationships between SMI and pathway completion were tested using survival analyses. Analyses were adjusted for age, sex, race, insurance status, service connection percent, Medicare eligibility, marital status, alcohol use, and drug use to account for other potential sources of health disparities. Sensitivity analyses evaluated differences in time to pathway completion via the Wilcoxon-Mann-Whitney test.

Results: The cohort (n=11,030) was primarily male (91.1%), with mean age of 55.8 ± 14.4 yrs, with mean body mass index of 32.9 ± 6.4 kg/m², and a mean pathway completion in 71 days, interquartile range (IQR): [33, 135]. Those with SMI had similar pathway completion rates (89.9% in SMI vs. 90.2% without), but a longer time to completion (83 days, IQR = [35.5, 185.5] in SMI vs. 70 days IQR: [32, 132]). Pathway completion time was significantly higher in those with SMI (Wilcoxon rank sum test difference = 9.0 days, 95%CI: [4.0, 14.0]). SMI was associated with a lower hazard of time to pathway completion (HR = 0.87, 95% confidence interval (CI): [0.91, 0.94] in unadjusted and HR = 0.87, 95%CI:[0.81, 0.94].

Conclusion: Although pathway completion rates were similar, Veterans with SMI were more likely to take longer before pathway completion. Additional investigation of factors that delay pathway completion may offer tailored avenues to improve the time to diagnosis.

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0483

STAKEHOLDER ENGAGEMENT STUDIOS TO EXPLORE THE JOURNEY TO DIAGNOSIS OF OSA INFORMED BY PRIMARY CARE PROVIDERS AND PATIENTS

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Introduction: Barriers to obstructive sleep apnea (OSA) diagnosis include operational misalignments and miscommunications among patients, providers, industry, insurers, and the healthcare system. To explore this, we engaged stakeholders to examine determinants of OSA diagnosis in primary care to optimize trial planning.

Methods: We conducted two, separate, virtual, 1-hour stakeholder engagement studio sessions with Penn Medicine Primary Care Providers (n=6) and patients referred for OSA diagnostics within prior year (n=3). Facilitation guides were used to elicit barriers/facilitators to reaching diagnosis. Sessions were facilitated by a sleep physician and advanced practice sleep nurse with two note-takers in attendance. Rapid matrix analysis approach

identified consistent themes within diagnosis barrier and facilitator categories. Themes were categorized by Safety Engineering Initiative for Patient Safety (SEIPS) work system domains: people (P), environment (E), tools (T), and tasks (T), PETT.

Results: Fourteen facilitators (2P, 3E, 3T, 6T) and 15 barriers (2P, 4E, 3T, 6T) were identified for “getting to OSA diagnosis.” Provider-level barriers include: hesitancy to provide anticipatory guidance to patients due to ambiguous workflows after referral, excessive referral order options, no access to templated patient instructions or quality education resources, confusing order panels and use of electronic health record (EHR) workarounds, and fragmented communication. Patient-level barriers include: timeliness of communication and care, sleep health unawareness, low technology literacy for EHR messaging, financial considerations, and insufficient follow-up from healthcare team. Provider facilitators include: classic OSA presentation, diagnosis decision aids, patient education resources, easy to find results in EHR, and low threshold to order referral due to knowledge about sleep. Patient facilitators include: trusted primary care relationship, choice of visit type (telehealth vs. in-person) and communication mode (phone call vs. text vs. EHR portal), active outreach/engagement by healthcare team, and access to educational materials.

Conclusion: Repeated studies, including stakeholders from varied sites, will further refine determinants with more saturation and validity. Engaging with stakeholders is supporting the design of a contextually relevant, end-user valued study to address undiagnosed OSA. Given the estimated high prevalence of undiagnosed OSA and the multiple stakeholders that contribute to the diagnostic process and experience, research-driven solutions will be impactful and better optimized with multi-level partnered research.

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0484

THE ASSOCIATION BETWEEN OBSTRUCTIVE SLEEP APNEA, ENERGY BALANCE AND BODY COMPOSITION: A CLINICAL COHORT

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Introduction: A couple of studies investigated the energy balance in patients with obstructive sleep apnea (OSA) but the results were inconclusive. Moreover, OSA have been associated with visceral adiposity but the mechanism has not been fully elucidated. We hypothesized that OSA was associated with lower basal metabolic rate (BMR) and increased nutrition intake which further attributed to body adiposity. The aim of the present study is to determine the association between OSA, and BMR, nutrition intake, and body composition (BC).

Methods: Patients were recruited from referrals to sleep lab for suspect OSA. Measurement of the BMR with indirect calorimetry and BC with bioelectrical impedance analysis, and blood sampling were conducted in the morning next to the overnight polysomnography. Afterward, participants were evaluated with short -form IPAQ, 3-day intake dietary, 7-day sleep log, and

wore Actiwatch for 7 days. The outcomes are resting energy expenditure (REE) and respiratory quotient (RQ), total fat mass (TFM), fat free mass (FFM), nutrition intake, daily total activity count, nightly sleep hour, and hormone. The association between OSA □apnea hypopnea index (AHI) $\geq 15/h$ □ and REE, RQ, TFM, and FFM was analyzed with multivariable linear regression.

Results: 85 patients were enrolled with median age 41.7 y/o, 78.6% male, body mass index (BMI) 25.4 kg/m², and AHI 28.8/h. Compared to no OSA, patients with OSA had higher BMI, RQ, TFM, activity count, and similar age, gender, REE, FFM, nutrition intake, sleep hour, cortisol, leptin, and Ghrelin. OSA was independently associated with RQ (coefficient 0.031; 95% CI 0.004-0.057, $p=0.022$) with adjustment of age, gender, BMI, and activity count but not associated with REE, TFM, and FFM.

Conclusion: Though OSA may be associated with metabolic dysregulation, it was not associated with energy balance and BC. Further validation of the findings in a large scale and multi-ethnicity cohort to validate the findings of the present study is warranted.

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0485

THE CLINICAL UTILITY OF ECHOCARDIOGRAPHY IN IDENTIFYING PATIENTS WITH HEART FAILURE AT A SINGLE ACADEMIC SLEEP CENTER

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Introduction: Heart failure and sleep disordered breathing are prevalent in the United States and often co-exist; diagnostic strategy and management for sleep disordered breathing may change based on the presence, absence and type of heart failure. The goal of this study was to evaluate how many additional patients would be identified with either heart failure with reduced (HFrEF) or preserved (HFpEF) ejection fraction through existing echocardiogram results when this diagnosis is not explicitly stated in the medical records for patients evaluated at a single academic sleep center.

Methods: A retrospective chart review was performed for all patients undergoing for a sleep study and/or a PAP device from February 2012 through September 2019 at the University of Arizona. Sleep disordered breathing was identified through either polysomnography (PSG) or home sleep apnea testing (HSAT). Patients were identified with heart failure with reduced ejection fraction if an echocardiogram (TTE) listed ejection fraction

Results: 2,817 patients were evaluated (age 57 (± 16) years), 53% male and 77% Caucasian). Ninety-nine patients (3.51%) were noted to have HFrEF based on past medical history and an additional 38 patients were identified through TTE. One hundred and fifteen patients (4.08%) were noted to have HFpEF based on past medical history and an additional 265 patients were

identified through TTE. Among these, a majority had OSA (77% HFrEF and 83% HFpEF), followed by combined OSA and CSA (7% HFrEF and 5% HFpEF), and primary CSA (5% HFrEF and 3% HFpEF). Of the patients identified after having reviewed TTE results, 6 (16%) with HFrEF and 42 (16%) with HFpEF developed treatment emergent central sleep apnea.

Conclusion: Existing echocardiography data in the electronic medical record can identify additional patients with HFrEF and HFpEF which may impact clinical diagnosis and management of sleep disordered breathing.

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0486

THE EFFECT OF ACOUSTIC RESONANCE THERAPY ON CPAP ADHERENCE

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Introduction: CPAP is the gold standard therapy for OSA. Unfortunately, a significant percentage of patients do not tolerate CPAP therapy. Of those who struggle, a significant portion state that nasal congestion is a limiting factor. Acoustic Resonance Therapy (ART) is a new non-medication based treatment for nasal congestion. We sought to determine if patients struggling with Medicare CPAP adherence and reporting nasal symptoms would benefit by the addition of ART.

Methods: This was an IRB approved, prospective, non-randomized, controlled pre-/post-treatment study. Twenty-five adult participants with an OSA diagnosis (AHI>5) were enrolled by BetterNight (OSA management, San Diego, CA). Participants were new to CPAP within the previous 90 days and were not Medicare adherent. Participants self-reported nasal congestion as a significant contributor to non-adherence. After struggling with CPAP for varying durations, participants began the Sonu vibrational headband system (SoundHealth Systems, Los Altos, CA) for 15 minutes each evening, immediately prior to wearing CPAP, on 28 sequential nights. The Sonu headband is worn circumferentially just above the eyebrows. It utilizes a smartphone application and the self-facing camera to capture a facial scan and estimate sinonasal volume which determines the appropriate resonant frequencies and harmonics. Two vibrational transducers produce a signal in the audible acoustic range, from 80 Hz to 16 KHz. Total nasal symptom scores (TNSS) were obtained at baseline and self-reported daily during Sonu use.

Results: Participants were 64% male, age 48.2 ± 12.9 , AHI 31.6 ± 22.7 , BMI 32.5 ± 6.6 (mean $\pm$ SD). On days the 25 participants used CPAP, mean hours (h) of use increased during the intervention from 2.7 ± 1.9 to 4.0 ± 2.2 (48%, $p=0.004$). On a subset of 12 participants for whom 28 days of pre/post data was available, mean total hours of CPAP use increased from 64.8 ± 51.6 to 94.0 ± 59.4 (45%, $p=0.0107$). CPAP Medicare adherence increased from $30.0\% \pm 27.4$ to $45.8\% \pm 35.0$

(53%, $p=0.0175$). TNSS decreased from 4.8 ± 2.2 to 2.1 ± 1.9 (-56%, $p=0.0016$).

Conclusion: The use of the Sonu headband was associated with increased hours of CPAP use, improved CPAP adherence and reduced nasal symptoms.

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0487

THE EFFECT OF NEGATIVE PRESSURE VENTILATION ON AIRFLOW IN OBSTRUCTIVE SLEEP APNEA SUBJECTS UNDERGOING DRUG INDUCED SLEEP ENDOSCOPY

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Introduction: Drug induced sleep endoscopy (DISE) is used to visually characterize pharyngeal airway collapse in obstructive sleep apnea (OSA) to help determine appropriate patients for OSA surgery. The procedure has grown in complexity with the addition of airflow recording and continuous positive airway pressure (CPAP) titration to obtain additional measures of airway collapsibility. Lung volume can also influence airway collapse in OSA but is not evaluated as part of routine DISE. The purpose of this study is to characterize the relationship between changes in lung volume and upper airway collapse during DISE to gain further insight into factors contributing to airway collapse and their potential roles in influencing surgical decision making.

Methods: This study is an ongoing IRB approved prospective clinical trial assessing the effects of negative pressure ventilation on airway collapse during DISE. Enrolled patients first undergo DISE evaluation per clinical routine including a CPAP titration. CPAP is then held at a level where patients exhibit stable flow limitation. A negative pressure ventilator shell is placed over the torso of the body and negative pressures of up to -25cmH₂O are applied to expand the chest and increase lung volume. Changes to nasal airflow and tidal volume are evaluated. The negative pressure ventilator is then released and changes to airflow back to baseline are recorded.

Results: Between 6/30/2022 and 11/30/2022, 5 patients completed the study. There were 4 men and 1 woman with an average age of 60 years, BMI of 26.67kg/m², and apnea-hypopnea index (AHI) of 44.44 events/hr. Average peak inspiratory flow increased from 8.38L/min to 13.78L/min and average tidal volumes increased from 155mL to 269mL on negative pressure ventilation.

Conclusion: Increases in lung volume from negative pressure ventilation during DISE can improve airflow and tidal volume suggesting that changes in lung volume can influence the severity of upper airway collapse. Further study to better characterize this relationship can help add additional diagnostic information regarding airway collapse characteristics to provide better informed surgical decisions and develop new interventions.

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0488

THE RELATIONSHIP BETWEEN MYOCARDIAL BLOOD FLOW AND DIASTOLIC FUNCTION IN A CLINICAL POPULATION WITH OBSTRUCTIVE SLEEP APNEAEhimen Aneni¹, Guljana Saeed², Stephanie Thorn², Edward Miller², Albert Sinusas², H. Yaggi³¹ Yale School of Medicine, ² Yale University School of Medicine,³ Department of Internal Medicine, Yale University School of Medicine

Introduction: Emerging evidence links abnormal myocardial blood flow reserve (MBFR), a marker of coronary microvascular dysfunction (CMD), and heart failure with preserved ejection fraction (HFpEF). However, the relationship between CMD and diastolic dysfunction (DD) in patients with OSA remains unclear. We analyzed the relationship between OSA, abnormal MBFR and markers of DD in a patient cohort.

Methods: Using healthcare records, we generated a cross-sectional database of 231 individuals who had sleep testing, echocardiogram(s), and cardiac PET stress test. Abnormal MBFR was defined as the stress-to-rest ratio of myocardial blood flow < 2.0. We created DD score with a point each given to a) left atrial volume index (LAVI) ≥34, b) average E/e' ratio >14/lateral e' >10/medial e' >7, and in a subgroup of 122 individuals with available data we added c) tricuspid regurgitation jet (TR) velocity > 2.7m/s. Higher scores suggest greater likelihood of DD. Models were adjusted for demographics and cardiometabolic risk factors.

Results: The mean (SD) age and BMI was 60(11) years and 39.5(8.7) kg/m²; 61% were female. Eighty-four participants had severe OSA (apnea-hypopnea index ≥ 30/hr). Compared to non-severe OSA, severe OSA was associated with 2-fold odds of abnormal MBFR (adjusted OR [aOR] 2.1, 95%CI:1.1–4.0). However, there was no association with abnormal LAVI, abnormal E/e' (average E/e' >14 vs. <9), or elevated TR velocity. In the adjusted model, abnormal MBFR was associated with abnormal E/e' (aOR 4.4 [95% CI: 1.6-11.8]) and elevated TR velocity (aOR: 3.7 [95%CI: 1.3-10.9]). Abnormal MBFR was associated with increase in DD score (range 0–2; aOR per-unit increase = 1.7 [95% CI: 1.0-3.0]). In the subset with data on TR velocity, abnormal MBFR was associated with a three-fold increase in the odds of a unit increase in DD score (range 0–3; aOR 3.3 [95% CI: 1.5,7.4]). The association between abnormal MBFR and DD was present regardless of OSA severity. Severe OSA was not associated with DD.

Conclusion: Abnormal MBFR/CMD may be implicated in the development of DD and HFpEF in patients with OSA. MBFR assessment may be useful in HFpEF risk stratification in non-severe OSA. Larger studies are required to determine the role of CMD in the development of DD/HFpEF in OSA.

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0489

TWO YEARS OF EXPERIENCE MANAGING OSA PATIENTS USING REMOTE PATIENT MONITORINGJerald Simmons¹, Hesam Sadeghian², Maggie Lavender³, Olivia Hua³, Patricia Hernandez³, Clifford Cordero³¹ Comprehensive Sleep Medicine Associates, PA, ² REST Technologies, ³ Comprehensive Sleep Medicine Associates

Introduction: Remote-Patient-Monitoring(RPM) is gaining implementation but to date, nightly-monitoring of OSA other than PAP devices, has not become a standard of care. We have taken the lead on OSA-RPM and developed a platform that imports data from a FDA-approved technology based on Cardiopulmonary-Coupling software linked to a ring oximeter (SleepImage) worn at night. Last year we presented on the practicality and patient adherence of our approach. Here we are presenting our experience over the past two years of using our platform to assist in the management of a wide range of OSA treatment approaches.

Methods: We developed software to manage the work-flow involved with nightly RPM of sleep. Patients wear a ring oximeter at night designed to provide data to a cloud-based platform for retrieval by our staff using our tracking software platform. Inclusion criteria: OSA with an abnormal baseline AHI. Also included are narcolepsy patients on oxybate, known to enhance OSA. Patient self-reported inputs regarding therapy are captured. Treatment approaches range from PAP (CPAP/BiLevel), Inspire-HGNS, Oral-Appliance-Therapy, Surgical-Interventions (i.e. MMA), orthodontics and combinations of the above.

Results: Since 1-1-2021, 140pts enrolled, 85 since 1/1/2022, and 87 currently monitored (12/1/2022). Ave 59yrs +/- 13, 64% Males. Discontinuation resulted for reasons ranging from clinical improvement, financial limitations, lack of compliance and other. Numerous treatment modifications have been guided without repeat NPSG/HSAT testing. OSA-RPM has influenced management of PAP, Inspire-HGNS, Oral-Appliance, orthodontics, and surgical therapies, as well as combination of the above. Detailed outcomes to be furnished. In brief, OSA-RPM with our system has provided extensive insight into efficacy of treatment approaches. Additionally, night to night variability can be better appreciated with this RPM technique, implying the limitation of single-night sleep studies.

Conclusion: Using this approach has allowed direct ongoing assessment of the impact of therapy modifications directed by both the clinician and the patient. There are currently no established protocols or guidelines for the use of this type of OSA-monitoring. It is important that guidelines be implemented to provide an improved level of care and not abused to just increase reimbursements with little added value, as abuse could hinder the growth of this type of care.

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0490**UNDER-RECOGNITION AND UNDERTREATMENT OF OBESITY HYPOVENTILATION SYNDROME (OHS) AFTER HOSPITAL DISCHARGE: A PERSISTENT CHALLENGE**Nathan Nowalk¹, Julie Neborak¹, Aristotle Leonhard², J.C. Rojas³, Babak Mokhlesi⁴¹ University of Chicago, ² University of Washington, ³ Rush University, ⁴ Rush University Medical Center

Introduction: Hospitalization for acute-on-chronic hypercapnic respiratory failure (ACHRF) in OHS is associated with increased short-term mortality. The 2019 American Thoracic Society's guidelines recommend that hospitalized OHS patients be discharged on nocturnal noninvasive ventilation (NIV). However, this was graded as a weak recommendation given that the data was retrospective and derived from European/Australian studies limiting generalizability to other healthcare systems. We aimed to assess post-discharge therapeutic plans for hospitalized patients with ACHRF and suspected OHS in an urban, tertiary care center in Chicago serving a large minority population.

Methods: We retrospectively queried the electronic health record of University of Chicago from 2008 to 2020 for hospitalized adults with BMI ≥ 35 kg/m² admitted from the emergency department, requiring NIV/mechanical ventilation with evidence of respiratory acidosis on first blood gas (pH < 7.35 with PaCO₂ ≥ 45 mmHg or PvCO₂ ≥ 50 mmHg). Subjects were excluded for obstruction on spirometry, greater than 20-pack year smoking history, CT evidence of parenchymal lung disease, acute neurologic process, significant left-sided heart failure and neuromuscular disease.

Results: Of the 797 obese patients requiring NIV/mechanical ventilation, we excluded 672 for lack of acute hypercapnia or low suspicion for OHS. The remaining 125 patients were predominantly Black (n = 116, 93%) and female (n = 94, 75%), mean age of 53 $\pm$ 13.9 years, mean BMI of 50.8 $\pm$ 12.8 kg/m², mean first pH of 7.22 $\pm$ 0.097, PaCO₂ 79.9 $\pm$ 24.5 mmHg (n = 31) and PvCO₂ 74.7 $\pm$ 20.2 mmHg (n = 94). On admission, 84 patients (67%) did not carry a diagnosis of OHS and 66 patients (53%) were PAP-naïve. 54% were discharged on PAP (43% CPAP, 43% Bilevel, and 14% other). Patients discharged on PAP were more obese (p = 0.001) and more hypercapnic (p = 0.002). Post-discharge polysomnography/sleep clinic referral was planned for 40% of patients. The 1-year mortality rate was 8% with no association recognized between 1-year mortality and PAP on discharge.

Conclusion: In our cohort, the proportion of patients discharged on nocturnal NIV was low. In contrast to the guideline recommendation, we did not find an association between being discharged on PAP therapy and mortality. Larger studies in more diverse populations are needed.

Support (if any):

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0491**USE OF NEUROMUSCULAR STIMULATION DEVICE OF TONGUE TO TREAT MILD OBSTRUCTIVE SLEEP APNEA IN VETERAN POPULATION.**Rekha Kallamadi¹, Kelash kumar², Amy Gravely³, Amber Henry⁴, Wajahat Khalil⁵, Muna Irfan⁵, Teri Zebrosky⁶¹ Hennepin County Medical Center, ² Hennepin Health care, ³ VA, Minneapolis, ⁴ VA, Minneapolis, ⁵ University of Minnesota, ⁶ VA Minneapolis

Introduction: Approximately 30 million adults in United States suffer from obstructive sleep apnea (OSA), with much higher prevalence in veterans. However, the treatment options of sleep apnea are currently limited due to CPAP device shortage, hence, unravelling a significant gap for alternative user-friendly therapeutic options. Neuromuscular stimulation device of the tongue is a novel FDA approved therapy becoming more relevant with the ongoing CPAP device shortage.

Methods: Neuromuscular stimulation device of tongue procured through regulatory process at VA Minneapolis, is offered to veterans with Mild OSA (AHI 5-15) on home sleep apnea testing. Baseline and post therapy data including patient's snoring, Epworth sleepiness score (ESS), Apnea - Hypopnea Index (AHI) was collected. Post therapy data was collected after initial 6 weeks of at least 20-minute daily followed by maintenance of 2 weeks of twice weekly use.

Results: A total of 112 patients with Mild OSA were offered the device as an alternative option of treatment during the period of December 2021 to August 2022. Of these, 39 patients completed therapy with mean age of 54.5 years (age ranging from 28y-80y), 36 were males and 3 were females. Among a total of 31 patients who completed their ESS pre and post questionnaire, and 22 patients who had pre and post AHI available, a paired t-test was obtained. In the 31 patients with pre and post ESS, the results of paired t-test showed a mean difference in ESS score of 1.90 with 95% CI (0.55 -3.25) with statistically significant P value of 0.0073. In the 22 patients with pre and post AHI, results of paired t-test showed Mean difference in AHI score of 2.54 with 95% CI (0.24-4.84) with statistically significant P value of 0.0316.

Conclusion: Findings suggest that the alternative treatment to CPAP provided to patients did result in improvement of Mild OSA both in subjective sleepiness symptoms and objective degree of residual apnea, and hence can be used as a feasible alternative therapy. However, the study is limited by small size (112) with a relatively low response rate from the participants (39), and availability of matched data (ESS -31, AHI -22). Therefore, larger studies are warranted.

Support (if any):

Abstract citation ID: zsad077.0492

0492**VARIABILITY IN HIGH ALTITUDE SLEEP DISORDERED BREATHING AND IMPACT OF ACCLIMATIZATION.**Farzin Jiwa¹, Pamela DeYoung², Kathy Pham³, Shyleen Frost³, Ledia Nasr³, Atul Malhotra², Erica Heinrich³, Jeremy Orr²¹ University of California, San Diego, ² University of California San Diego, ³ University of California Riverside

Introduction: Individuals who travel to high altitude experience variable levels of poor sleep quality and sleep disordered breathing, which can have neurocognitive and other systemic impacts. Past studies by our group and others have shown that the apnea hypopnea index (AHI) increases, and nocturnal oxygen saturation decreases at higher altitude. This may change over time with acclimatization to environmental hypoxemia. The aim of this study was to examine the trajectory and variability in high altitude sleep disordered breathing effects in healthy young adult volunteers.

Methods: Twenty healthy volunteers were recruited from a local university (35% women), mean age 23.5(20.0, 32.2) years and BMI of 30.0(28.0, 35.9) kg/m². Peripheral Arterial tonometry based home sleep apnea tests (HSAT; WatchPat One) was performed on all subjects at sea level up to three days prior to transportation via car to high altitude (3800m White Mountain Research Center - Barcroft Station, CA). Participants continued HSAT testing for three consecutive nights at high altitude sleeping in any position, without oxygen, acetazolamide, or use of any other medications impacting sleep or breathing. Mixed effects modeling was used to compare sleep parameters across nights.

Results: Subjects' characteristics: median (IQR)[range] age 23(20,32)[19,39] years, BMI 30(28, 36)[23,48] kg/m², 35% women. AHI at altitude night 1 (67±4 events/hour) was significantly higher than sea level (7±4 events/hour; P< 0.001). Mean sleep SpO₂ at altitude night 1 (79±1%) was significantly lower than sea level (95±1%; P< 0.0001). There was no statistically significant change in AHI or mean sleep SpO₂ on nights 1-3; however substantial variability was noted between individual trajectories.

Conclusion: Healthy young adults exhibit severe Sleep Disordered Breathing when traveling to high altitude. Despite acclimatization, the severity of Sleep Disordered Breathing remained relatively unchanged overall. However substantial differences in individual trajectories were apparent. Larger studies are needed to understand how differences in genetics, sex, and other factors might impact Sleep Disordered Breathing at altitude. In addition, the impacts of (or tolerances to) altitude are likely to be broadly informative towards Sleep Disordered Breathing, hypoxemia, and other areas.

Support (if any): N/A

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0493**A NEW PERSPECTIVE ON EXPLORING THE PREDICTIVE FACTORS OF BLOOD PRESSURE REDUCTION DURING CPAP TREATMENT IN OSA**Bo Sun¹, Jiani Shen², Ting Yang², Zili Meng², Jing Xu²¹ The Affiliated Huaian No. 1 People's Hospital of Nanjing Medical University, ² Department of Respiratory and Critical Care medicine, the Affiliated Huaian No. 1 People's Hospital of Nanjing Medical University

Introduction: The predictive factors of BP response to continuous positive airway pressure (CPAP) in obstructive sleep apnea

(OSA) are still being explored. We aimed to assess the antihypertensive effect of CPAP considering the obstructive respiratory event-triggered BP surge profiles in 130 subjects with severe OSA and untreated hypertension.

Methods: Nocturnal BP was monitored continuously and synchronized with polysomnography. Event-triggered BP surge profiles were studied: BP surge as the value of event-related systolic BP elevation; BP index as the number of BP surge events of ≥10 mmHg per hour. Patients were then divided into two groups according to the median BP index (high and low BP surge groups) and assigned to 4 weeks of CPAP. Changes in BPs and plasma biomarkers were compared. After the initial evaluation, patients with a better BP response in the high BP surge group were then followed up for the second evaluation at 24 months.

Results: Overall, a modest decrease was observed in both office and asleep BPs at the 4-week follow-up; however, BPs dropped more markedly in patients in high BP surge group than those in low BP surge group, in both office systolic BP (SBP:5.3 mmHg vs.2.2 mmHg, P=.005) and diastolic (DBP:4.0mmHg vs.1.2 mmHg, P=.011), especially the asleep SBP (9.0mmHg vs.2.1 mmHg, P<.001). For 30 cases in the high BP surge group, optimal BP control was achieved in 60.0% of patients and BP < 140/90mmHg reached up to 83.3% after 24 months of CPAP. Linear regression revealed that BP index was significantly associated with BP decrease during CPAP treatment.

Conclusion: Our results suggest that high event-triggered BP surge was a sensitive predictor of BP response to CPAP in patients with severe OSA and hypertension.

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Abstract citation ID: zsad077.0494

0494**EARLY FEASIBILITY STUDY ON USE OF NONINVASIVE TEMPORAL INTERFERENCE STIMULATION OF THE HYPOGLOSSAL NERVE IN THE TREATMENT OF OSA**Lee Shangold¹, William Hanes², Wyle Solomon³, Adam Williamson⁴, Florian Missey⁴, Malin Silvera Ejneby⁵, Jan Trajilinek⁶¹ ENT and Allergy Associates, ² Somnial Inc., ³ Somnial Inc., ⁴ Institute de Neurosciences des Systemes, Aix-Marseille Universite, ⁵ Department of Biomedical Engineering, Linkoping University, ⁶ Central European Institute of Technology

Introduction: Hypoglossal nerve stimulation has proven effective as an alternative to Positive Airway Pressure (PAP) machines in treating obstructive sleep apnea (OSA). The only currently FDA-approved hypoglossal nerve stimulator requires surgical implantation. Somnial Inc. is developing a noninvasive nerve stimulator based on temporal interference (TI), such that multiple supra-kHz-modulating electrical fields overlap to create a hyper-localized field modulating at a lower, nerve-stimulating frequency equal to the offset between the original fields. Bilateral stimulation reduces lateral movement of the tongue and requires less energy applied to the individual nerves. In early studies, transcutaneous, bilateral TI stimulation showed strong forward and central tongue movement with long-term tolerability.

Methods: To determine the clinical impact of TI on the treatment of OSA, 11 patients recently diagnosed with moderate to severe OSA (AHI 15-50/hour) based on in-lab polysomnography (PSG) and BMI < 35 were subjected to bilateral TI stimulation of the hypoglossal nerves during another PSG. Two pairs of electrodes were placed on either side, medial to the inferior aspect of the mandible overlying the genioglossus muscle. The frequencies

were modulated in a 4-second-on, 2-second-off pattern. Initial power settings were determined as sufficient to move the tongue without discomfort and were increased throughout the night in an approach similar to a CPAP titration study.

Results: 5 of the 11 patients analyzed in the study, including 4 out of 4 women, responded to the therapy (AHI reduction from baseline by >50% and an AHI of < 20/hour). Patient questionnaires indicate the treatment was well tolerated throughout the night.

Conclusion: These promising proof of concept results after a single night indicate the potential for the use of TI in the treatment of OSA. Transcutaneous application of stimulation energy via TI energy could be used to determine the efficacious doses required to reduce AHI events in the at-home healthcare setting. This justifies future research in long-term, chronic-treatment studies with TI stimulation and the advancement of a home-based device.

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0495

EPWORTH SLEEPINESS SCALE WORTH FOR SLEEP APNEA SCREENING: A LARGE COHORT OF POLYSOMNOGRAPHIES VIA NATURAL LANGUAGE PROCESSING

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Introduction: Obstructive sleep apnea (OSA) is a major sleep disorder that presents with excessive daytime sleepiness (EDS). Epworth Sleepiness Scale (ESS) as a measure of EDS is used to monitor population sleep health. We aim to assess the association between ESS and apnea hypopnea index (AHI) extracted from polysomnography (PSG) reports using natural language processing (NLP) algorithms.

Methods: We curated 90,483 PSG notes from the nationwide Corporate Data Warehouse (CDW) of Veteran Affairs (VA) from 10/1999 to 10/2020. We used rule-based nearest neighbor and forward-backward NLP techniques to extract ESS and AHI from PSG reports. We reported the performance of NLP algorithm compared to chart review. We used AHI>5 as the cut-point to identify OSA and incremented the threshold for abnormal ESS from 5 to 15 to find the best cut-point for stratification of EDS. We used logistic regression to report the performance of the ESS cut-point using the area under the curve (AUC). The model also adjusted for age, sex, BMI, race, ethnicity, and Charlson comorbidity index.

Results: 39,318 patient clinical notes (age 50±15 years; BMI 30±5) notes documented both AHI and ESS. (50±15 year; 30±5 BMI). NLP algorithms accuracy was ≥ 90%. We observed the same level of sensitivity (57%) or specificity (42%) for ESS of 5 and 10, but the ESS of 5 resulted in the best negative (27%) and positive (72%) predictive value for AHI prediction. The area under curve for prediction OSA based on ESS cut-off of 5 was 0.50 (95%CI, 0.49, 0.51) and the AUC improved to 0.65 (95%CI, 0.64, 0.65) after adjustment.

Conclusion: Our results suggest that ESS is not an effective tool for predicting AHI. Reducing the ESS cut-off to 5 may enhance its predictive value, but it does not have clinical implication in identifying patient with OSA. Sleep medicine clinicians may use

other sleep questionnaires, such as the STOP-Bang questionnaire, which is reported to be a reliable, concise, and easy-to-use screening tool.

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0496

FACTORS ASSOCIATED WITH THE REPORT OF TROUBLE SLEEPING TO HEALTHCARE PROVIDERS IN ADULTS AT HIGH RISK FOR OBSTRUCTIVE SLEEP APNEA

Staci Orbell¹, Paul Scott², Lynn Baniak³, Eileen Chasens¹, Cassandra Godzik⁴, Bomin Jeon⁵, Jonna Morris², Faith Luyster¹

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Introduction: Obstructive sleep apnea (OSA) is often underdiagnosed and untreated partially because only one-third of adults with symptoms of OSA talk to a healthcare provider (HCP) about their sleep. It is unclear how sociodemographic and clinical factors may influence communication with HCPs regarding sleep difficulties in adults at risk for OSA. This analysis examined associations between sociodemographics, comorbidities, and OSA-related symptoms and reporting trouble sleeping to an HCP in adults at high risk for OSA.

Methods: The sample comprised adults at high risk for OSA (STOP-Bang of ≥5 or STOP ≥2 + body mass index (BMI) >35 kg/m² or male sex) from the 2015-2018 National Health and Nutrition Examination Survey (n=2009). Participants were asked, "Have you ever told a doctor or other health professional that you have trouble sleeping?" OSA-related symptoms included daytime sleepiness, fatigue, insomnia, nocturia, snoring, and snorting/gasping/breathing cessation during sleep. Weighted binomial logistic regression models were employed.

Results: Participants were middle aged (mean age = 53.21 years + 0.5), obese (mean BMI = 34.76 + 0.25 kg/m²), and primarily male (71.9%) and white (65.2%). Half of the sample (50.8%) never reported trouble sleeping to an HCP. Female sex, former smoking, and diabetes, obstructive lung disease, daytime sleepiness, insomnia, nocturia, and/or snorting/gasping/breathing cessation during sleep were associated with higher odds of reporting trouble sleeping to an HCP. Snoring was not a significant predictor. Mexican American and non-Hispanic Asian race, having less than a high school education, and male sex were associated with lower odds of reporting trouble sleeping to an HCP.

Conclusion: Not reporting trouble sleeping to an HCP among adults at high risk for OSA is common. Differences in sex, race, education, smoking status, comorbidities, and OSA-related symptoms exist between those who have and have not reported trouble sleeping to an HCP. Insomnia and snorting/gasping/breathing cessation during sleep were the strongest symptom-related factors associated with reporting trouble sleeping to an HCP. It is important for HCPs to ask all adults about sleep problems, recognizing that men, racial minorities, and persons with lower educational attainment may be less likely to initiate a conversation about trouble sleeping.

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0497

WITHDRAWN

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0498

HOME AUTOMATED OSA QUANTIFICATION OF NIGHT-TO-NIGHT SHORT TERM VARIABILITY: ANALYSIS OF THE ASSOCIATED CONDITIONS*Jean-Louis Pépin¹, Jean-Benoit Martinot², Sebastien Bailly³, Renaud Tamisier³, Nhat-Nam Le-Dong⁴*¹ HP² Laboratory, Inserm U¹³⁰⁰, University Grenoble Alpes, Grenoble, FRANCE, ² CHU UCL Namur Site Sainte-Elisabeth, Namur, BELGIUM, ³ HP² Laboratory, Inserm U¹³⁰⁰, University Grenoble Alpes, Grenoble, FRANCE, ⁴ Sunrise, Namur, BELGIUM

Introduction: Single night in-lab polysomnography (PSG) is still the conventional procedure for making obstructive sleep apnea (OSA) diagnosis, or alternatively a home sleep apnea test (HSAT) in patients free from comorbidity. Recent publications drew attention to considerable internight within-subject variability in OSA clinical status, notably but not only with HSAT. Taking benefit of multiple nights recording in home-based setting using measurements of mandibular jaw movement (MJM) combined with automated machine learning analysis, this study aimed to investigate the effect of change in sleep parameters on the internight variability of the apnea hypopnea index (VAHI).

Methods: 160 adults suspected of having OSA successfully completed 3 sleep tests at home with the Sunrise device (Sunrise, Namur, Belgium). Data analysis implied generalized estimating equation (GEE) regression.

Results: Even though the internight variability of AHI was not statistically significant at the population level with a mean VAHI of -1.1 ± 7.8 events/h, such variability could lead to misdiagnosis and wrong therapeutic decisions based on a single night. After adjusting for effects of gender, body mass index (BMI), age, total sleep time (TST) and time interval between sleep tests, regression models indicated that sleeping in supine position was positively and independently associated with VAHI, the AHI increased by 0.95 event/h for each 10% of increase in sleeping time in supine position. VAHI was negatively and significantly ($p < 0.01$) associated with sleep efficiency and deep sleep; VAHI decreased of 0.16 event/h (0.04 to 0.28) and 0.29 event/h (0.17 to 0.42) for each % of increase in sleep efficiency and proportion of deep sleep, respectively.

Conclusion: At the individual level, position, sleep efficiency and deep sleep are associated with short-term internight variability in AHI. Clinical decision based on a single-night testing may lead to errors in OSA diagnosis with delayed or wrong therapeutic decisions.

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0499

IDENTIFICATIONS OF SYMPTOMS CLUSTERS BY THE QUEBEC SLEEP QUESTIONNAIRE IN SLEEP APNEA PATIENTS*Frederic Series¹, Annie Lajoie¹, Yves Lacasse²*¹ Laval University, ² IUCPQ

Introduction: Sleep apnea (SA) patients may present different symptom clusters. The clinical importance of such clustering is supported by the differences in the incidence of cardiovascular

diseases between hypersomnolent and non hypersomnolent patients. The Quebec Sleep Questionnaire (QSQ) has been elaborated 20 years ago that documents quality of life in SA patients by measuring the impact of the disease on five different domains (nocturnal and diurnal symptoms, hypersomnolence, emotions and social interactions). Previous cluster analyses took into account the frequency of typical SA symptoms. Many, but not all symptoms selected in these studies are addressed in the QSQ. The objective of this study is to determine if quality of life clusters can be identified using responses collected from the QSQ in SA patients.

Methods: A cluster analysis was completed in symptom scores collected from the QSQ+ Epworth scores in 147 patients who filled in the questionnaire during its validation (75.5 % males, age: 53 ± 11 y, BMI: 30.4 ± 4.7 Kg.m², AHI 31.3 ± 14.8 /h). For each item, patients were considered as symptomatic for scores ≤ 4 (the lowest the score the higher the impact) and for ESS > 10 .

Results: Three clusters were identified: patients in cluster 1 (20.4 % of patients) can be identified as minimally symptomatic in each domain. In the cluster 2 (32.6 %), quality of life was mainly impacted by hypersomnolence with disturbed sleep. Patients in cluster 3 (46.9 %) reported important impacts on their quality of life in each domain of the QSQ. Gender, BMI and AHI did not differ between the three clusters. However, patients in cluster 1 were significantly younger than those of cluster 2 (50.5 ± 9.9 and 57.6 ± 11.9 years, respectively, $p = 0.01$).

Conclusion: Different clusters of quality of life can be identified by the QSQ in SA patients. These clusters seem to have close similarities with previously reported symptom frequency driven clusters. The relationship between quality of life symptom clusters and long-term clinical outcomes should be explored in a large prospective cohort of sleep apnea patients.

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0500

IMPACT OF POSITIVE AIRWAY PRESSURE ON DRUG-INDUCED SLEEP ENDOSCOPY TO DELIVER PRECISION MEDICINE*Supriya Singh¹, LEQUAN DANG²*¹ Baylor College of Medicine, ² MICHAEL E DEBAKEY VA MEDICAL CENTER

Introduction: Sleep endoscopy during natural sleep will be ideal, to evaluate the upper airway during episodes of obstructive sleep apnea, but quite difficult to achieve. Drug-induced sleep endoscopy is an alternative standard of care to document the level and severity of the collapse of the upper airway. It is especially of benefit for patients who are intolerant to positive airway pressure and is used as a part of a work-up for alternative therapy for treating sleep apnea. Using propofol infusion and a Bi-spectral index of 50-70, to monitor the depth of sedation, the upper airway collapse can be determined with sleep endoscopy, conducted initially without CPAP and then with a CPAP ranging from 10 cmH₂O to 20 cm H₂O in patients who failed PAP therapy.

Methods: Drug-induced sleep endoscopy (DISE) was carried out in the bronchoscopy suite by the same Pulmonologist with an anesthesiologist to manage sedation using Propofol. Adequate depth of sedation was confirmed by the presence of snoring, and a BIS. The patient underwent the entire procedure while supine. The severity of obstructions followed the velum/oropharynx/tongue base/epiglottis and was recorded as patent/

partial/complete. The obstruction pattern was classified into circumferential, anteroposterior, or lateral. Tongue base obstruction was identified when the tongue base pushed the epiglottis causing lumen obstruction. The DISE was conducted initially without CPAP followed by DISE with CPAP.

Results: Out of a total of 80 patients, upon application of the CPAP, 3 patients (4%) had patent velum and the base of the tongue. 3 (4%) with partial collapse of the velum and complete collapse of the base of the tongue. One (1%) had persistent anterior-posterior and lateral wall collapse of the velum, but the base of the tongue was patent. 68 (85%) had improved lateral wall collapse and obstruction of the velum improved from complete to partial anteroposterior collapse. Five patients (6%) continued to have persistent circumferential collapse of the velum.

Conclusion: Drug-induced sleep endoscopy performed in combination with various pressures of CPAP allows real-time visualization of the impact of these pressures on the upper airway. It allows us to provide alternative treatment options sooner than later.

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0501

MANGANESE AND SLEEP HEALTH OUTCOMES IN U.S. ADULTS: ANALYSIS OF THE NHANES 2017-2020

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Introduction: Manganese (Mn) is an essential trace mineral required for normal growth and physiological processes. However, inadequate or excess Mn can have a detrimental impact on human health. Despite the essentiality, little is known about the relationship between Mn and sleep. The objective of this study is to examine the relationships between blood Mn levels and sleep patterns (duration, midpoint of sleep, obstructive sleep apnea [OSA] symptoms, and trouble sleeping) in U.S. adults.

Methods: Data from the 2017 to 2020 National Health and Nutrition Examination Survey (NHANES) was used for the analysis. Adults aged 18 or older with both blood Mn levels and sleep parameters were included (n=8356). Self-reported fall asleep time and wake up time in the past week were used to calculate sleep duration and midpoint. Trouble sleeping and symptoms of OSA were also collected. Blood Mn levels were divided into quintiles for analysis. Multivariable logistic regressions that accounted for complex study design were used.

Results: The mean (SE) blood Mn concentration was 9.7 (0.1) µg/L, and was higher among participants who were younger, female, identified as non-Hispanic Asian, had lower income, were non-smokers, and had lower iron levels (P< 0.05, for all). About 25% of adults had short sleep duration (< 7 hours) on weekdays. OSA symptoms were noted in 49% of adults. In men, the odds of short sleep duration on weekdays were higher among those with the lowest Mn level (Q1: < 7.0 µg/L) than the reference group (Q3: 8.5-10.0 µg/L) after adjusting for age, race, income, smoking, and iron (OR: 1.5, 95% CI: 1.1-2.1, P=0.03). Among women, Q2 (7.0-8.4 µg/L) was the related to the lowest odds of OSA symptoms compared to all other groups after adjusting for covariates (P=0.049).

Conclusion: Lower or higher Mn levels in blood were related to poor sleep health in U.S. adults, which suggests that inadequate

or excessive Mn intake might be harmful to sleep. Future studies on the mechanisms of these relationships are needed.

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0502

NUMBER OF NIGHTS TO ACHIEVE HIGH SENSITIVITY/SPECIFICITY FOR DETECTING OSA USING A LARGE US SAMPLE BY HOME UNDER-MATTRESS DEVICES

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Introduction: Clinical sleep studies typically rely on one night for OSA detection and diagnosis. However, uncertainty exists regarding the degree of AHI stability across different nights. Population studies collecting continuous nightly data on a large scale enable detection of night-to-night variability in OSA severity; this study is the largest to date for evaluation of the number of nights to achieve high sensitivity/specificity for OSA detection.

Methods: Sleep-disordered breathing was analyzed by a commercially available home monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies Inc., California, USA) that passively monitors sleep using piezo-electric sensors. Validated sleep/respiratory parameters were derived from device data. De-identified data were analyzed, following review and exemption of the study (#57681) from Stanford University IRB. Data from 10/01/2021 to 09/30/2022 were reviewed in 96,228 individuals with 19,148,323 recorded nights. Individuals with at least 300 nights with a computed AHI (TST≥4hrs) were included in the analytic dataset.

Results: A total of 23,105 individuals (10,711 men, 49.6±12.93 years; 9,430 women, 49.4±12.85 years; 2,964 no gender provided, 50.4±14.37 years) with 7,947,840 recorded nights met the inclusion criteria. Maximum (but not mean) AHIs for each individual for 3 randomly-selected (vs. consecutive) nights revealed sensitivities (≥95%)/specificities [and CIs] of 94.9%[94.8,95.1]/82.5%[82.2,82.7], 95.2%[95.0,95.5]/94.3%[94.1,94.5], and 96.2%[95.8,96.6]/97.9%[97.8,98.0] for detecting any, moderate-to-severe, and severe OSA, respectively, as categorized by mean AHI over 1 year. Sensitivities for a single night were in the low 70s, and, for maximum AHI over two randomly-selected nights, near 90%, with a tradeoff for decreased specificities for 3+ nights. For moderate-to-severe and severe OSA subjects over 1 year, means of 5.1±7.7% and 5.4±7.3% nights, respectively, showed OSA severity decreases by 2+ categories (i.e., moderate to normal, severe to mild/normal).

Conclusion: Use of a noninvasive in-home monitoring device enabling collection and analysis of a large sample of sleep/respiratory data on a continuous nightly basis showed that a single night yields low sensitivity for detection of OSA and on average OSA severity decreased by 2 categories on 5% or more nights. Maximum (but not mean) AHI across 3 non-consecutive nights yields good sensitivities/specificities for moderate-to-severe and severe OSA detection. Ongoing work explores statistics for nights beyond 3 to further improve sensitivity/specificity.

Support (if any):

Abstract citation ID: zsad077.0503

0503**RESPIRATORY EFFORT DURING SLEEP AND PREVALENT DIABETES IN OBSTRUCTIVE SLEEP APNEA**Jean-Benoit Martinot¹, Atul Malhotra², Nhat-Nam Le-Dong³, Jean-Louis Pépin⁴¹ CHU UCL Namur Site Sainte-Elisabeth, Namur, BELGIUM, ² University of California San Diego, La Jolla, CA, USA, ³ Sunrise, Namur, BELGIUM, ⁴ HP² Laboratory, Inserm U1300, University Grenoble Alpes, Grenoble, FRANCE

Introduction: Obstructive sleep apnea (OSA) and type 2 diabetes (T2Dia) is a frequent clinical association. Beyond OSA-related hypoxic burden, increased respiratory effort (RE) is one of the main features of OSA and contributes to sympathetic overactivity that in turn might participate to glucose homeostasis dysregulation. The independent contribution of RE to the OSA-T2Dia pathogenesis remains to be demonstrated. The study aims to determine the impact of metrics assessing sleep RE derived from the sleep mandibular jaw movements (MJM) signal on the prevalence of T2Dia in a large cohort of patients addressed for in-laboratory conventional polysomnography (PSG) with suspicion of OSA.

Methods: An interpretable machine learning model was built to predict T2Dia from clinical data, PSG indices, and MJM-derived parameters (including the time spent with increased RE, expressed in % of TST). The analysis included 1128 subjects, randomly assigned to training (n=853) and validation (n=275) subsets with equal T2Dia prevalence of 11%.

Results: The risk stratification model based on 19 input features including increased RE showed good performance for predicting prevalent T2Dia (sensitivity=0.81, specificity=0.89). Post-hoc interpretation using the Shapley additive explanation (SHAP) method revealed that increased RE was the most important risk factor of T2Dia after other clinical factors for T2Dia (i.e., sex, BMI and average SpO₂), ahead of standard PSG metrics (including the apnea-hypopnea index and oxygen desaturation index).

Conclusion: These findings suggested that the proportion of sleep time spent with increased RE automatically derived from MJM is a potential new reliable metric to predict prevalent T2Dia in patients with OSA.

Support (if any):

Abstract citation ID: zsad077.0504

0504**STOP BANG FAN, A NOVEL SCREENING TOOL OF OSA IN SLEEP CLINIC.**Ashraf Gohar¹, An-lin Cheng¹, Abid Bhat¹¹ UMKC

Introduction: We noticed that patients with OSA when admitted to hospital requested a fan even in winter. We explored the literature and did not find any reports about fan use in OSA. STOP-Bang questionnaire has been widely used in preoperative clinics [4-6], sleep clinics [7-8] to detect patients at high-risk of OSA. STOP Bang score 5 or more has high risk of OSA. We did a pilot study to explore if adding the use of FAN, especially in winter, would increase the sensitivity of STOP Bang questionnaire in the sleep clinic.

Methods: We screened 350 consecutive patients referred to our sleep clinic for suspected OSA in the period of March 2021 to April 2022, with STOP Bang FAN questionnaire. The questionnaire added if they use FAN during sleep in addition to the air condition and if they still use it in winter.

Results: 255 (73%) used FAN during sleep and 210 (60%) used the fan in winter. 247 patients had PSG, the others did not for variable reasons, including refusing COVID test before the study, insurance issues or no insurance. In the 247 patients who had the PSG the sensitivity of STOP Bang score 5 or more, STOP Bang score 5 or more + Sleeping with FAN and STOP Bang score 5 or more + sleeping with Fan in winter for OSA AHI 5 or more were 78%, 83% and 89%. The sensitivity of STOP Bang score 5 or more, STOP Bang score 5 or more + Sleeping with FAN and STOP Bang score 5 or more + sleeping with Fan in winter for moderate and severe OSA AHI 15 or more were 65%, 74% and 79%. The sensitivity of STOP Bang score 5 or more, STOP Bang score 5 or more + Sleeping with FAN and STOP Bang score 5 or more + sleeping with Fan in winter for severe OSA AHI 30 or more were 55%, 64% and 71%.

Conclusion: Adding the use of the FAN and especially FAN in winter during sleep to STOP Bang would increase the sensitivity of the questionnaire for suspected OSA in sleep clinic.

Support (if any):

Abstract citation ID: zsad077.0505

0505**3-YEAR FOLLOW-UP OF PATIENTS WITH OSA ON TELEMONITORING**Maria Guimarães¹, Elisabete Silva¹, Catarina Costa¹, Andreia Silva¹¹ Hospital da LUZ Guimarães

Introduction: Obstructive Sleep Apnea (OSA) is a highly prevalent respiratory disease. In the subgroup of OSA patients on Positive Airway Pressure (PAP), telemonitoring for CPAP (Continuous Positive Airway Pressure) have emerged as follow-up option to monitor and detect poor compliance to treatment. We aimed to understand whether telemonitoring is an independent factor in the therapeutic adherence of OSAS patients.

Methods: A retrospective assessment was carried out in patients followed in the Sleep Medicine consultation between March 2019 and June 2022. A total of 312 patients with Resmed® model S10 CPAP devices with residual apnea detection algorithm, mean therapy pressure, and the number of hours of daily use were included. After placement of the PAP patients were reassessed by consultation at 3, 6, 12, 24 and 36 months of therapy.

Results: A total of 312 patients were evaluated, 203 men and 109 women, with a mean daily use of 6 hours and 43 minutes, with a standard deviation of 1 hour and 52 minutes. The residual AHI of averaged 2.58/hour. In June 2022, 30 patients were included at 3 months, 30 at 6 months, 41 at 12 months, 84 at 24 months and 127 at 36 months, with a mean daily use of respectively: 4.29 (median 5.17), 4.33 (median 4.44), 3.52 (median 4.45), 5.05 (median 5.59) and 4.40 hours (median 5.28), with no statistical significance and adherence being similar from the first trimester, as well as in the divisions of patients per group. This analysis shows that adherence did not decrease over the months of telemonitoring, which may mean that patients felt permanently monitored. The mean Residual AHI was respectively: 4.64, 2.08, 2.33, 2.33 and 2.37/hour, we found that the disease remained controlled and without much variation. We obtained

an excellent adaptation to therapy in 262 patients (84%), and 16% (50 patients) abandoned therapy.

Conclusion: In patients with a confirmed diagnosis of OSA treated by PAP, telemonitoring has proven to be a helpful tool for a better follow-up and therapeutic adjustment, promoting ideal compliance to therapy, which is effective as early as the first three months.

Support (if any):

Abstract citation ID: zsad077.0506

0506

5-YEAR, MULTI-CENTER, OBSERVATIONAL STUDY TO ASSESS SAFETY, EFFECTIVENESS AND USE OF CAD/CAM PATIENT-MATCHED OAT FOR OSA TREATMENT

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Introduction: Oral appliance therapy (OAT) is used for the treatment of obstructive sleep apnea in mild to moderate patients. First-time fit is important for treatment burden and dental economics. This prospective, “real-world” collaborative (physician/dentist) study will assess the primary endpoint of at least a 50% reduction in baseline apnea-hypopnea index (AHI) at five years. Additionally, this study will assess fit during initial delivery. The Panthera D-SAD is a CAD/CAM, 3D-printed OAT. Updated design and comfort features have been integrated. Changeable rods (mechanical hinge) provide the mechanism for protrusion. This study fulfills French reimbursement requirements.

Methods: OAT naïve individuals with moderate OSA (AHI 15-30) or those with severe OSA (AHI 30 or greater) who decline CPAP will be included, meeting all other criteria. An estimated 337 participants will be enrolled at 11 centers in France. Consecutive sampling will be used. Participants will be medically assessed, a prescription for OAT obtained, dental assessment and then, the initial fitting will be at Visit 1 (V1). Standard of care for the study duration will be followed. Evaluation time points are three months (medical), six months (dental), two years (both), and five years (both). Secondary endpoints include OAT side effects, oxygen desaturation indices, quality of life, self-reported adherence, and subjective symptoms at the aforementioned time points

Results: To date, a total of 56 subjects have been enrolled. This report is focused on the 24 subjects who have had V1, OAT fit, and titration visits. The demographics are as follows: (F=8); Averages (and standard deviation) for the following are age 51.2 (1.5); baseline AHI of 20.5 (6.07); ODI 14.71(8.9); SpO2 93.46 (1.06), BMI 25.73 (3.13), and rod length of 26.6mm (1.05). 91.6% of dentists reported at V1 that no rod changes were required. 82.6% of patients indicated the OAT was comfortable, three patients had dental or muscle pain, and one, the device was too tight.

Conclusion: V1 is a crucial step in the therapeutic journey. This early data demonstrate a high OAT acceptance rate for dentists and patients while reducing the time required for first-time fit, thus lowering practitioner and patient burden and costs.

Support (if any): Panthera Dental Inc, Quebec City, Quebec Canada

Abstract citation ID: zsad077.0507

0507

A WIRELESS PATCH-BASED POLYSOMNOGRAPHY SYSTEM FOR CONDUCTING IN-LAB SLEEP STUDIES

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Introduction: Current attended in-lab polysomnographic sleep studies are time-consuming and costly, primarily due to the time required to “hook-up” a patient to multiple electrodes and sensors and meet the quality assurance and safety requirements of an in-lab study. We developed a wireless PSG system (Onera STS - Onera Health, NL) consisting of four disposable patches and reusable pods to record full polysomnography that may reduce hook-up time while preserving standards of an attended polysomnography in the lab.

Methods: We used the Onera STS system for monitoring EEG, EOG, EMG, forehead reflectance SaO2, ECG, bioimpedance derived respiratory airflow and effort, airflow via nasal cannula, snoring sounds, body position, actigraphy, and leg movements, and accessory online monitoring of finger SaO2, ECG, nasal cannula airflow and video via RemLogic 4.0 or REM logic MPR system for Q/A and safety monitoring. Seventeen subjects (8 male, 9 female, age 18-to-75 yrs, BMI 29.9±6.0 kg/m2) were monitored for the evaluation of sleep apnea. We measured hook-up times and observed oxygen saturation and cardiac rhythm throughout the night.

Results: Mean hook-up time for the Onera STS was 5:22±1:17 minutes and for the additional on-line sensors (Finger SaO2, ECG and nasal cannula) was 3:15±1:10 minutes, resulting in an average hook-up time of less than 10 minutes. Onera PSG data revealed a mean oxygen desaturation event rate of >3% (ODI3) of 8.8 (SD 18.6) and a mean fall of oxygen saturation (Δ SaO2/event) of 4.4 (SD 1.2). The accessory online SaO2, ECG and video monitoring showed that no subjects demonstrated sustained nocturnal hypoxia, severe cardiac arrhythmia or parasomnia events that would have required interventions.

Conclusion: The Onera STS system substantially lowers the burden to conduct attended polysomnographic sleep studies. In combination with standard monitoring of SaO2, ECG and video, it meets the safety requirements for attended sleep studies while reducing the overall operational and capital equipment costs. The ease of application together with the reduced hook-up time makes it now possible to implement polysomnographic sleep studies in the hospital setting, particularly in addition to conventional bedside monitoring units such as ICU-, step-down unit- or hospital beds.

Support (if any):

Abstract citation ID: zsad077.0508

0508**ADHERENCE WITH TRANSORAL NEUROMUSCULAR ELECTRICAL STIMULATION THERAPY IN VETERANS WITH MILD OSA**Carl Stepnowsky¹, Tania Zamora¹, Cesar Cervantes-Gameros¹, Brandon Nokes²¹ Veterans Affairs San Diego Healthcare System, ² VA San Diego Healthcare System

Introduction: Mild obstructive sleep apnea (OSA) is increasingly common in the VA. The first-line therapies are medical devices worn each night while asleep to control or manage OSA. These devices are burdensome for our patients with mild OSA. Stronger oral musculature can help reduce mild OSA. A new transoral Neuromuscular Electrical Stimulation (NMES) device was recently approved by the US FDA called eXciteOSA (Signifier Medical Technologies, Needham, MA). The eXciteOSA device provides gentle, low-frequency electrical stimulation intraorally to the tongue muscle and is efficacious for mild OSA.

Methods: A retrospective review of the data of the 71 patients prescribed the eXciteOSA device at the VA San Diego was analyzed. The device is prescribed for use over two phases: (1) one 20-minute session per day over 42 consecutive days and then (2) one 20-minute session on two days out of each week. Respiratory therapists performed 1-2 phone call visits to assess symptoms and address device concerns.

Results: 68 of the 71 patients used the device for at least one 20-minute session over the first 42 days. Three patients (4.2%) did not use the device. Adherence was 60% for all 71 patients and 63% for the 68 patients who used it at least once. This means that, on average, our Veteran patients completed one 20-minute session on 25 of the first 42 days.

Conclusion: Recent non-Veteran data showed an adherence rate of ~80% (percentage of days with one completed 20-minute session over the first 42 days). Our analysis found an adherence rate of ~60%, suggesting significant room for improvement in eXciteOSA device use in Veterans. Future adherence studies should look at methods to improve device use over the first 42 days. In addition, more research may be needed to understand better what amount of use is efficacious on an individual basis. Some patients may obtain an adequate response with fewer sessions, while others may need more. It is unknown which endotypes of OSA most benefit from NMES, but further research is ongoing.

Support (if any): VA RR&D D2651-R and the Sleep Medicine Section of the VA San Diego Healthcare System supported this project.

Abstract citation ID: zsad077.0509

0509**ADVERSE EVENT REPORTS FOR CPAP, HNS AND ORAL DEVICES: AN FDA MAUDE DATABASE ANALYSIS**Len Liptak¹, Mark Murphy²¹ ProSomnus Sleep Technologies, ² Funktional Sleep LLC

Introduction: This investigation analyzes adverse event reports (AERs) from the FDA MAUDE database for Continuous Positive Airway Pressure (CPAP), Hypoglossal Nerve Stimulation (HNS) and Oral Appliance Therapy (OAT) devices. The FDA defines adverse events as undesirable experiences associated with medical devices that should be reported when the outcome is death,

life threatening, hospitalization, disability, required intervention, or serious medical events.

Methods: Publicly available industry reports were utilized to estimate prevalence of AERs.

Results: From January 1, 2022 to September 2022, AERs for CPAP, HNS and OAT were 72,251, 11,867 and 30, respectively. From January 2017 to September 2022, the annual count of AERs for CPAP and HNS increased 245% and 252% respectively. The annual count of AERs for OATs decreased -1.3% over the same period. Device Problems For CPAP, "Degradation" comprised 96.6% of the AERs. For HNS, "Event Without Problem" and "Device Sensing" comprised 78.6% and 11.0% of AERs respectively. For OAT "Event without Identification" and "Breakage" comprised 40.0% and 9.8% of AERs respectively. Patient Problems For CPAP, seven patient problems comprise over 80% of reports: No Clinical Signs/Conditions, 57.3%; Dyspnea, 5.4%; Headache, 5.3%; Sore Throat, 4.3%; Respiratory Tract Infection, 4.1%; Cough, 3.5%; Unspecified Respiratory, 3.0%. For HNS, nine patient problems comprise over 80% of reports: Unspecified Infection, 19%; Pain, 15.2%; No Clinical Conditions, 9.2%; Bacteria Infection, 8.7%; Perforation of Vessels, 7.1%; Erosion, 7.1%; Wound Dehiscence, 4.9%; Swelling/Edema, 4.8%; Hematoma, 4.4%. For OAT, seven patient problems comprise over 80% of reports: Hypersensitivity/Allergic Reaction, 23.5%; Reaction, 19.0%; No Known Impact, 15.9%; Swelling, 8.7%; Pain, 6.2%; Discomfort, 4.5%; Erythema, 3.8%; Rash, 3.5%.

Conclusion: This analysis suggests that healthcare providers may wish to consider the significant differences in the frequencies and the severities of adverse events when prescribing treatment modalities for patients with OSA. Dental side effects, a widely referenced reason for limiting the utilization of OAT devices, do not show up in the top 80% of the most frequently reported types of adverse events.

Support (if any):

Abstract citation ID: zsad077.0510

0510**ALTERED FUNCTIONAL CONNECTIVITY OF THE ASCENDING RETICULAR ACTIVATING SYSTEM IN OBSTRUCTIVE SLEEP APNEA**Won Chul Shin¹, Jung-Ick Byun¹, Geon-Ho Jahng¹, Ki-Young Jung²¹ Kyung Hee University Hospital at Gangdong, ² Seoul National University Hospital

Introduction: Recurrent arousals in obstructive sleep apnea (OSA) may lead to alteration in functional connection involving in the ascending reticular activating system (ARAS). We aimed to evaluate resting-state functional connectivity (FC) between eight ARAS nuclei and 105 cortical/subcortical regions in OSA patients and matched controls.

Methods: Total of 50 patients with moderate to severe OSA and 20 controls without OSA underwent overnight polysomnography (PSG) and resting-state functional magnetic resonance imaging in the following morning. Seed to voxel analysis of ARAS-cortical FC was compared between the patients and controls. The ARAS nuclei included dorsal and median raphe nucleus, locus coeruleus (LC), laterodorsal tegmental nucleus (LDTg), pedunculopontine tegmental nucleus, pontine nucleus oralis, parabrachial complex, and ventral tegmental area (VTA). Correlations between average FC values of significant clusters and PSG parameters were calculated in the patients.

Results: FC values in the three of the ARAS nuclei (LC, LDTg, and VTA) were significantly different between the group. The FC value between the LC and the precuneus cortex, posterior cingulate gyrus, and right lateral occipital cortex (LOC) was increased in OSA patients compared to the controls. The FC value between the LDTg and right LOC was enhanced, but the FC one between the VTA and right LOC was reduced in the patients. The average LC-cortical FC values positively correlated with the arousal index ($r=0.282$, $p=0.047$), apnea index ($r=0.325$, $p=0.021$), or apnea-hypopnea index ($r=0.302$, $p=0.033$) in OSA patients.

Conclusion: The results of this study support alteration in ARAS-cortical FC in OSA patients. Degree of the noradrenergic LC-cortical FC may be related to arousal or OSA severity in the patients.

Support (if any):

Abstract citation ID: zsad077.0511

0511

AN OBSERVATIONAL RETROSPECTIVE STUDY OF THE EFFICACY OF ORAL APPLIANCE THERAPY (OAT) IN TREATING OBSTRUCTIVE SLEEP APNEA (OSA)

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Introduction: Obstructive sleep apnea (OSA) affects approximately 15-30% of males and 10-15% of females in North America. While positive airway pressure (PAP) therapy remains the standard in the treatment of OSA, oral appliance therapy (OAT) has emerged as a viable non-invasive alternative. However, there are limited data on OAT efficacy published, and therefore many sleep clinicians question its efficacy. We conducted a 14-month single-center consecutive chart review to evaluate OAT efficacy.

Methods: A manual chart review was performed for records from 11/1/2020 to 12/10/2022. Potential charts were identified in the electronic health record by searching for prescriptions for OAT and orders for home sleep apnea tests (HSAT). If there was a test performed after the prescription was written, the chart was reviewed manually for previous test results and verified that post-OAT testing was conducted. Extracted information included age, BMI, gender, pre-OAT HSAT apnea-hypopnea index (AHI), and post-OAT HSAT AHI. The 4% desaturation criteria for AHI was used in accordance with current Medicare guidelines. A paired t-test was performed after ensuring there were no outliers and a normal distribution.

Results: There were 10 patients included in the analysis: 6 women, 4 men. The average age was 61.1 years (95% CI 49.9-72.3), and average BMI was 28.9 (95% CI 25.3-32.4). Prior to intervention, 2 patients had moderate OSA with the rest mild (average pre-OAT AHI 13). After OAT device, 4 patients had mild OSA and the rest did not have residual OSA (average post-OAT AHI 4). The results of the paired t-test showed that the mean AHI was statistically significantly different between the two groups ($t=-4.54$ with $df=9$, $p=0.0014$). The mean difference was -8.1 with 95% confidence interval for the true difference in the population mean AHI of -12.1, -4.06.

Conclusion: The results demonstrate efficacy of OAT in treating OSA. Clinicians should consider OAT as both primary and secondary therapy for mild-to-moderate OSA.

Support (if any): N/A

Abstract citation ID: zsad077.0512

0512

APNEA-HYPOPNEA INDEX DOES NOT CORRELATE WITH NON-ALCOHOLIC FATTY LIVER DISEASE SCORES

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Introduction: Obstructive Sleep Apnea (OSA) and Nonalcoholic Fatty Liver Disease (NAFLD) are two conditions that have increased in prevalence in the United States. NAFLD is a spectrum of liver disease ranging from steatosis to non-alcoholic steatohepatitis (NASH) to cirrhosis. The purpose of this project is to study the relationship between OSA, measured by apnea-hypopnea index and/or arterial oxygen saturation nadir (O2 nadir) during sleep (independent variable) vs. extent of NAFLD as measured by non-invasive scores such as NAFLD Fibrosis score, aminotransferase to platelet ratio index (APRI), BARD score and FIB-4 score (dependent variable).

Methods: A convenient sample of 91 haphazardly selected veterans with OSA and NAFLD from the Veterans Affairs (VA) Computerized Record System (CPRS) system were included in the study. NAFLD eligibility was determined by abdominal ultrasound, CT scan, MRI, or biopsy. Dependent variables were NAFLD scores of APRI, NAFLD Fibrosis, BARD, and FIB-4. OSA was determined by in-lab polysomnogram or home sleep study. Independent variables were AHI, O2 nadir, age and body mass index (BMI). Patients with a history of alcohol abuse or Hepatitis B or C were excluded from the study. A multiple regression analysis was used to describe the relationship between OSA and NAFLD scores. $P < 0.05$ was considered statistically significant.

Results: Age correlated with FIB-4 score, BARD score, and NAFLD fibrosis score ($p = < 0.001$, 0.003 , < 0.001 , respectively). BMI correlated with NAFLD fibrosis score ($p < 0.001$). When controlled for age and BMI, AHI and O2 nadir did not correlate with APRI, NAFLD fibrosis, BARD, or FIB-4 scores.

Conclusion: OSA measured by AHI and O2 nadir do not correlate with severity of fatty liver disease as measured by APRI, NAFLD fibrosis, BARD, or FIB-4 scores.

Support (if any): None

Abstract citation ID: zsad077.0513

0513

ASSESSING PRECISION ORAL APPLIANCE EFFICACY USING FREQUENCY- AND RISK-BASED INDICES

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Introduction: Apnea-hypopnea index (AHI), a frequency-based index commonly used to define the severity of obstructive sleep apnea (OSA), fails to capture the risk related to OSA. Sleep apnea-specific hypoxic burden (SASHB) appears to be more predictive of OSA-related risk than AHI but has only been studied in cohorts of untreated individuals. This is the first assessment of the ability of precision oral appliance therapy (OAT) to reduce

SASHB and the use of SASHB, rather than AHI, to define therapeutic efficacy.

Methods: Data previously obtained from a clinical study investigating prediction of response to precision OAT in OSA were analyzed. Study participants with OSA ($n = 11$ mild, $n = 19$ moderate, and $n = 18$ severe) completed two-night level 3 home sleep tests before and after receiving a precision oral appliance (ProSomnus Sleep Technologies, Pleasanton, CA). Apnea-hypopnea index and SASHB were calculated. For SASHB, a cut-off of 53 %min/h was selected based on data suggesting that values above this limit are associated with OSA-related risk; for AHI, cut-offs of < 10 h-1 and < 15 h-1 were selected due to their widespread use in clinical practice.

Results: Precision oral appliance therapy reduced AHI from 31.6 ± 19.2 h-1 to 11.7 ± 15.8 h-1 ($p < 0.001$) and SASHB from 83.2 ± 63.6 %min/h to 25.2 ± 42.3 %min/h ($p < 0.001$). Using an AHI-based definition of therapeutic efficacy, 83% (for AHI < 15 h-1) and 71% (for AHI < 10 h-1) of participants achieved efficacy with precision OAT. However, when the risk-based SASHB definition of therapeutic efficacy (SASHB < 53 %min/h) was used, precision OAT efficacy increased to 90%.

Conclusion: In the population studied, precision OAT significantly improved SASHB. The use of AHI, a frequency-based index of OSA, appears to misclassify some individuals as therapeutic non-responders to precision OAT despite their having an SASHB in the low-risk range. Sleep apnea-specific hypoxic burden likely provides a more meaningful assessment of OSA treatment efficacy as it accounts for the risk associated with the disease.

Support (if any): This work was supported by ProSomnus Sleep Technologies.

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0514

ASSOCIATION OF MUSCLE DISTRIBUTION AND INSOMNIA SEVERITY IN COMISA

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Introduction: Insomnia and obstructive sleep apnea (OSA) may co-exist, and it is now named comorbid insomnia and OSA (COMISA). Such combined condition is associated with increased morbidity, and impairment, which requires treatment for both insomnia and OSA. Bioelectrical impedance analysis (BIA) is a widely used convenient method of body composition. In OSA patients, muscle and fat distribution are different among different sex, and severity of OSA. We hypothesized that the muscle distributions in COMISA were different from OSA, which can help early identification COMISA to optimize treatment.

Methods: All the patients aged 18 or older with symptoms of sleep disturbances who visited single tertiary sleep clinic in Korea were enrolled from December 2017 to September 2022. All patients underwent structured sleep evaluation, insomnia severity index (ISI), overnight polysomnography and BIA. All patients with apnea-hypopnea index (AHI) 15 or greater were enrolled. The COMISA were classified by insomnia symptoms based on the ISI score greater than 15.

Results: Total of 3328 subjects were finally enrolled (79.7% males and 20.3% females), and among them 29.5% ($n=981$)

was COMISA. Compare to OSA without insomnia symptoms COMISA were older (COMISA, 56.6 ± 12.9 , OSA, 54.3 ± 13.3 ; $p < 0.001$), and were more likely to be female (COMISA, 27.5%, OSA, 17.3%; $p < 0.001$). Although AHI had no significance, apnea was lower, and hypopnea was higher in COMISA than OSA. The muscle distribution in COMISA was different compared to OSA in non-obese groups (BMI < 25). In both male and female, total muscle mass (MM), skeletal muscle mass (SMM), Rt and Lt arm (RAMM, LAMM), Rt and Lt leg (RLMM, LLMM), and trunk (TMM) muscle mass, and fat free mass (FFM) were significantly different between non-obese COMISA and OSA. The correlation analysis in non-obese COMISA group revealed that ISI is negative correlated with muscle masses in both sex (M:F); MM (M,F: $\rho: -0.09^*, -0.16^*$), SMM ($\rho: -0.01^*, -0.17^*$), RAMM ($\rho: -0.07^*, -0.15^*$), LAMM ($\rho: -0.07^*, -0.16^*$), RLMM ($\rho: -0.09^*, -0.15^*$), LLMM ($\rho: -0.09^*, -0.16^*$), TMM ($\rho: -0.08^*, -0.17^*$), FFM ($\rho: -0.1^*, -0.16^*$) [$*p < 0.05$].

Conclusion: This study revealed that the muscle distribution is different in non-obese, male and female, moderate to severe COMISA population. And insomnia symptom severity has negative relation with trunk and limb muscle masses. Our study suggests possible insomnia symptoms among OSA patients have different pathomechanisms in relation to body muscle distribution.

Support (if any):

Abstract citation ID: zsad077.0515

0515

AWAKE ENDOSCOPY OPTIMIZES TOLERANCE AND EFFECTIVENESS OF HYPOGLOSSAL NERVE STIMULATION

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Introduction: Hypoglossal nerve stimulation (HGNS) which has been available and FDA approved since 2014 in the US may allow for effective treatment of obstructive sleep apnea (OSA) in patients without concentric collapse on Drug induced Sleep Endoscopy and other clinical parameters who have failed CPAP. Tolerance of the stimulation parameters may be problematic in a subset of patients not allowing them to adhere to the therapy. Although there are not currently clinically authoritative studies regarding the role of awake endoscopy in management of such patients, visualizing what comfortable settings that allow for effective tongue protrusion while awake potentially allowing for effective treatment of upper airway obstruction in the office setting might serve as a surrogate for ensuring optimization of such treatment during patients' sleep and this is a retrospective review of such patients at Tufts Medical Center in Boston MA.

Methods: A retrospective chart review of patients who were implanted with a HGNS device (Inspire TM) who did not tolerate therapy and proceeded to awake endoscopy to optimize therapy settings that allowed tolerance or comfort of stimulation were analyzed. Patients who had HGNS and awake endoscopy as part of clinical assessment at any time during the course of their clinical evaluations were included in the review.

Results: Out of 129 patients implanted at Tufts Medical Center in Boston, MA, 13 such patients (Approximately 10 % of the total number of HGNS implanted patients) proceeded to awake endoscopy to optimize therapy as noted above. A subset of these patients had improved adherence to therapy

and treatment of OSA with HGNS therapy subsequently to such management.

Conclusion: A subset of patients may remain adherent to HGNS therapy after strategically performing awake endoscopy for ensuring comfort and adequacy of tongue protrusion during awake endoscopy in the outpatient setting. This retrospective review indicates that awake endoscopy may optimize tolerance and adherence of HGNS therapy for treatment of OSA in selected patients.

Support (if any): None

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0516

BIOPSYCHOSOCIAL INTERVENTION USING VIRTUAL MULTIDISCIPLINARY GROUP WITH IMPROVED PAP ADHERENCE AFTER 1 YEAR POST INTERVENTION.

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Introduction: Prevalence of untreated sleep apnea among veterans is 22.2 %. Untreated patients are at risk for multiple adverse outcomes including chronic sleep deprivation, excessive day time sleepiness, chronic fatigue, depression, and cardiovascular complications including hypertension, coronary artery disease, cerebrovascular accidents, pulmonary hypertension as result of increased sympathetic activity during apnea episodes. Nonadherence to PAP therapy within the first week of treatment are up to 50 % of patients who use PAP device during the first week between 12-25 % discontinue by PAP use by year 3. Barriers to PAP use include physical problems with PAP hardware, knowledge gaps, and psychological issues.

Methods: Veterans from sleep medicine and sleep apnea clinics as well as multiple primary care clinics participated in the PAP adherence group following 6 weeks biopsychosocial model. The intervention included weekly synchronized video encounters of behavior sleep specialist, respiratory therapist and sleep clinic nurse with the targeted group of veterans with sleep apnea and poor PAP adherence. This approach has multiple benefits, including being patient centered, cost effective and efficient with ability to help veterans at various motivational levels, assist 6-10 veterans virtually in 6 one-hour group sessions and easy care coordination.

Results: A total of 21 veterans with sleep apnea participated in virtual multidisciplinary group to improve PAP adherence between September 2020 and January 2021. Patients PAP adherence before intervention, post intervention and 1 year after intervention was evaluated. Percent of patients using PAP >2 hours before intervention was 5 %, immediately after intervention it increased to 20 %, and there was further increase up to 33% after 1 year post.

Conclusion: A structured multidisciplinary biopsychosocial intervention demonstrated statistically significant improvement in PAP adherence which persisted up till 1 year post intervention. In fact additional improvement of >2 hours of PAP usage was noted in this patient group suggesting possible long term benefit of psychosocial multidisciplinary intervention on PAP adherence. This study also demonstrated efficiency of utilization of virtual/telemedicine platform for psychosocial intervention and brief behavioral therapy.

Support (if any):

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0517

CHANGES IN AUTOCAPAP SETTINGS AS A FUNCTION OF WEIGHT LOSS OVER TIME IN BARIATRIC SURGERY PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Positive pressure remains the main treatment for obstructive sleep apnea (OSA). Compared to traditional continuous positive airway pressure (CPAP) machines with fixed pressure settings, AutoCPAP machines can titrate settings based on user requirements and transmit data to the pulmonologist. While bariatric surgery has been associated with improvement in OSA, there is little data examining associations between postoperative weight loss and positive pressure requirements longitudinally. The purpose of this study was to evaluate changes in AutoCPAP pressure settings as a function of weight loss over time.

Methods: A retrospective review of bariatric surgery patients at a single institution from 2018-2022 was performed. Participants included patients with OSA who used an AutoCPAP machine and had at least one appointment within the first 18 months postoperatively. Preoperative BMI, postoperative BMI and percent excess weight loss were analyzed. AutoCPAP parameters used as markers of OSA severity included 95th or 90th percentile pressure depending on the machine and apnea-hypopnea index (AHI). Paired t-tests were performed to evaluate changes in BMI and 90th/95th percentile pressures. Linear regressions with fixed effects were performed to investigate changes in pressures and BMI over time.

Results: 345 patients with OSA who underwent bariatric surgery and were prescribed AutoCPAP were evaluated. Of those, twenty-eight (8%) were compliant with their AutoCPAP and were included in this study. Overall, 90th/95th percentile pressures improved postoperatively by $1.32 \text{ cmH}_2\text{O} \pm 0.33$ ($P = 0.003$). Patients with a preoperative BMI ≥ 40 demonstrated improved 90th/95th percentile pressures over time by $1.22 \text{ cmH}_2\text{O} \pm 0.34$ ($P = 0.002$) while those with a preoperative BMI < 40 did not ($-1.7 \text{ cmH}_2\text{O} \pm 0.86$; $P = 0.106$). Reduction in BMI was associated with reduction in 90th/95th percentile pressures at 2-6 weeks and 2-6 months postoperatively.

Conclusion: Patients with a higher preoperative BMI demonstrated improved positive pressure requirements postoperatively compared to patients with a lower preoperative BMI. This suggests that there may be a critical BMI after which further weight loss is not associated with significant improvements in OSA. Further, positive pressure requirements may decrease most significantly within the first several months postoperatively.

Support (if any):

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0518

CHARACTERISTICS OF OBSTRUCTIVE SLEEP APNEA AMONG PREGNANT JAPANESE WOMAN AND THEIR BIRTH OUTCOMES

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Introduction: Pregnant women are at an increased risk for obstructive sleep apnea (OSA) due to pregnancy-related weight gain. However, a detailed clinical study on OSA and birth outcomes among pregnant women in eastern Asia has not been conducted. This study, therefore, aimed to investigate characteristics of OSA among pregnant Japanese women and their birth outcomes.

Methods: Subjects were selected from pregnant women who underwent a polysomnography (PSG) during 28–36 weeks gestation at Tokyo Medical and Dental University Hospital. Diagnosis of OSA was based on sleep history and PSG with an apnea-hypopnea index (AHI) ≥ 5 (OSA+ group). Those with AHI < 5 were regarded as the OSA- group. The body height, weight, head circumference, and chest circumference of all offspring were measured at birth and 1 month of age. Data were analyzed statistically using unpaired t test and Pearson correlation and logistic regression analyses.

Results: Of 102 pregnant Japanese women, 13.7 % were diagnosed with OSA during the third trimester. PSG data showed significant differences in AHI between the OSA- (1.2 ± 1.0) and OSA+ (14.8 ± 16.7) groups. Moreover, there were significant differences in the oxygen desaturation index, mean and minimum SpO₂, and mean and maximum heart rate between the OSA+ and OSA- groups. The logistic regression analysis revealed that AHI was associated with body mass index (OR, 1.274; $p = 0.001$), but not with age, gestational age, and body height, suggesting that high BMI is a risk factor for OSA in Japanese pregnant women. The Epworth sleepiness scale score was comparable between the two groups. A comparison of body weight between the pregnant mothers and their offspring showed that the maternal weight during the third trimester was negatively associated with offspring's weight at birth and at 1 month of age in the OSA+ group.

Conclusion: Findings suggest that a high BMI is a major risk factor for OSA among pregnant Japanese women.

Support (if any):

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0519

COMPARING THE DELTA POWER DURING TITRATION OF INSPIRE THERAPY AND PAP THERAPY

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Introduction: Delta power is a known indicator of sleep drive and sleep pressure. Non-REM sleep delta power is increased in patients with sleep-disordered breathing. Treatment of sleep-related breathing disorder reduces delta power. The purpose of this study is to investigate and compare delta power between individuals on INSPIRE therapy and individuals on PAP therapy.

Methods: A retrospective review was performed by selecting nine patients who underwent INSPIRE titration study at the MU HealthCare Sleep Disorders Center, between 8/1/2021 and 8/1/2022. Nine patients with similar age and gender who underwent PAP titration study were selected from the database (PolySmith®). Spectral analysis was performed using F4-M1 leads, and delta power was calculated for Stage N3 portion during the last sleep cycle.

Results: There were 3 patients on INSPIRE who did not have any N3 sleep and those were excluded. Thus, average delta power in 6 patients during INSPIRE titration was 541.88. In contrast, the average delta power for 9 patients during PAP titration was 554.93.

Conclusion: Results showed that there was minimal difference in patients' delta sleep during titration of INSPIRE therapy as compared to patients during titration of PAP therapy. However, there were limitations including the amount and timing of N3 sleep, success of titration study, patient's medications - which may have altered the sleep architecture, and comorbidities such as PLMS (which untreated can affect sleep).

Support (if any): The authors have no sources of support to declare.

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0520

COMPARISON OF UPPER AIRWAY STIMULATION OUTCOMES IN STAR AND ADHERE SUB-POPULATIONS: NARROW AHI RANGE VS BROAD AHI RANGE

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Introduction: Upper Airway Stimulation is an approved technology for the treatment of moderate to severe obstructive sleep apnea. Differences exist among specific indications for use and/or coverage limits, with certain geographies supporting a broader AHI range (15-65 events/hr) compared to others that are limited to a narrower range (AHI 20-50 events/hr). This study provides a comparison of the outcomes related to these two groups.

Methods: This is a retrospective analysis of two data sets: (1) STAR pivotal data set, including only patients with a baseline AHI (average of pre-implant and post-implant/pre-activation AHIs) between 20 - 50 event/hr; compared to (2) ADHERE Registry data set, including only patients with a baseline AHI (pre-implant) between 15 -65 events/hr. Baseline demographics,

as well as AHI and Epworth Sleepiness Scale (ESS) at 12 months post-implant, were compared between the two groups.

Results: A total of 94 STAR subjects (AHI 20-50) were compared to 1604 ADHERE subjects (AHI 15-65; with AHI 15-20 in 192 subjects and AHI 50-65 in 208 subjects). The STAR group had a significantly lower age (54.6 ± 10.2 vs 60.2 ± 10.9 , $p < 0.001$), lower baseline AHI (31.8 ± 7.6 vs 34.7 ± 12.6 , $p < 0.001$) and more males (85.1% vs 75.5%, $p = 0.03$) compared to the ADHERE group. At 12-months post-implant, there were no significant differences in AHI (15.2 ± 15.5 vs 15.7 ± 14.7 , $p = 0.33$), change in AHI from baseline (16.5 ± 14.7 vs 18.5 ± 20.3 , $p = 0.23$), Sher Responder Rate (67.7% vs 63.4%, $p = 0.47$) or ESS (7.0 ± 4.2 vs 6.9 ± 4.6 , $p = 0.53$) between the STAR and ADHERE groups.

Conclusion: While subjects implanted under the narrower AHI range (20-50 events/hr) were younger and had a significantly lower AHI at baseline, results in these patients were comparable to patients implanted under the broader range of AHI 15-65.

Support (if any): The STAR study and ADHERE Registry were sponsored by Inspire Medical Systems, Inc.

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0521

CORRELATION BETWEEN SOCIO-DEMOGRAPHIC RISK FACTORS AND SELF-REPORTED APNEA

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Introduction: Apnea, pauses in breathing, is a chronic and rising condition in the US and is itself a risk factor for various conditions such as hypertension, cardiovascular disease, and stroke. This study aims to analyze the National Health and Nutrition Examination Survey (NHANES) dataset to see if certain socio-demographic risk factors contribute to the prevalence of apnea.

Methods: From 2015 to 2018 (using two consecutive cycles), a secondary dataset from NHANES was obtained. All 11,759 community dwelling individuals 16 years and older who responded to the sleep disorder questionnaire in the above survey were considered as study subjects. Questions were asked in the home by trained interviewers regarding sleep trouble including if they recalled episodes where they stopped breathing during sleep. In this study, we sorted the data to see the mean chance of "snort or stop breathing" amongst various categories such as gender, age, ethnicity, marital status, education, smoking history, alcohol consumption, income, physical activity, and obesity.

Results: The following socio-demographics were identified as having a higher association with apnea ($p < 0.0001$): male gender, ages 41 – 50, smokers, and obesity. Unusually, those with higher physical activity self-reported more frequent episodes of stop breathing ($p < 0.00001$). No significant association was noted for stop breathing events when looking at income, educational level, Hispanics vs. non-Hispanics, frequent alcohol consumption and health insurance.

Conclusion: These results confirm some of the established risk factors for apnea such as male sex, obesity and age. Oddly, those with higher self-reported physical activity had higher stop breathing events. Self-reported responses in the NHANES data could be

associated with recall bias and treated as one of the current study limitations. Of note, there appears to not be an economic factor in terms of income or health insurance in the incidence of stop breathing events. Further awareness of these risk factors and knowing which sociodemographic groups have higher incidences of apnea can help with primary prevention of serious health outcomes.

Support (if any):

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0522

CPAP IMPROVES COGNITION IN BRAIN-HEALTHY MALES: SECONDARY ANALYSIS OF A RANDOMIZED TRIAL

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Introduction: Obstructive sleep apnea (OSA) is associated with cognitive impairments. However, in many adequately powered randomized trials, there is weak or no evidence for the causal effect of treating OSA on cognition. A common characteristic of these randomized trials is heterogeneous participants. We hypothesize that there is a subset whose cognition could be improved by OSA treatment using CPAP.

Methods: This is a secondary analysis of the Apnea Positive Pressure Long-term Efficacy Study (APPLES), a randomized, double-blind, two-arm, sham-controlled, multicenter trial. The primary analysis had adult participants with baseline AHI ≥ 10 /hour. We restricted to those with both baseline polysomnogram and outcome available: $n = 787$. The outcome is 6-month Sustained Working Memory Overall index at mid-day, which was not significantly different in the primary analysis. The original exposure is randomized active- or sham-CPAP. However, the adherence rate (≥ 4 hours for $>70\%$ nights in 1-month) is higher for active than sham ($\chi^2 p < 0.001$). Therefore, we re-defined a non-randomized exposure as both under active-CPAP and being adherent ($n = 165$) vs. all others ($n = 622$). To account for confounding, covariates were clustered into 17 groups, plus age, sex, education, and baseline cognition. Individual treatment effect (ITE) was estimated using matching, which finds a matched group for each individual with similar covariates but opposite exposure. The ITE is the difference between two potential outcomes: the counterfactual outcome from the mean outcome of the matched group, and the factual outcome as observed.

Results: The overall ITE was non-significant compared to 0 (t -test $p = 0.4$). A subset of 285 (Group 1) could have improved cognition if under active-CPAP and adherent (average ITE 0.68, $p < 0.001$); another subset of 328 (Group 2) could have worsened cognition (average ITE -0.64, $p < 0.001$). Group 1 is characterized by more males, higher baseline cognitive scores, lower EEG-derived brain age index, and slightly more depression; the opposite for Group 2.

Conclusion: Assuming the ITE is unbiased, relatively brain-healthy males with OSA can improve their cognition once OSA is treated by CPAP.

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0523**DISPARITIES IN DISCUSSION OF SLEEP-RELATED BREATHING DISORDERS WITH A PHYSICIAN**Solomon Johnson¹, S. Mehdi Nouraie²¹ University of Pittsburgh School of Medicine, ² University of Pittsburgh Department of Medicine

Introduction: Race, immigration status and healthcare access have known associations with sleep health in socially disadvantaged groups. The prevalence and severity of sleep disorders, such as obstructive sleep apnea (OSA) are higher among non-whites and underdiagnosed in socially disadvantaged groups. Associations between sleep health and country of birth have also been identified. Certain minority groups are known to be less likely to report symptoms of OSA or insomnia to a physician. It's therefore possible that propensity for sleep disorder self-report plays a role in disparities of sleep health in socially disadvantaged groups. To our knowledge the predictors of sleep disorder self-report have yet to be studied. We aim to assess the predictors of sleep disorder self-report and analyze for associations with race, immigration status and healthcare access.

Methods: We conducted a cross-sectional analysis of 9,163 adult (age >18) patients in the National Health and Nutrition Examination Survey 2017-2020 database who answered the sleep disorders questionnaire and had race, immigration status and healthcare access data. Any answer to "How often do you snort or stop breathing (during sleep)?" was used as a surrogate endpoint for symptoms of OSA. "Yes" to "Ever told a doctor that you had trouble sleeping?" was used as a surrogate endpoint for sleep disorder self-report. We analyzed this cohort for associations between demographic characteristics, symptoms of OSA and sleep disorder self-report with survey sampling weights in STATA 17.0.

Results: In patients with symptoms of OSA (24%), measures of limited healthcare access, such as lack of health insurance (OR=1.59, p=0.030), or lack of location routinely visited for healthcare needs (OR=1.77, p=0.024), predicted higher likelihood of sleep disorder symptom non-disclosure, after adjustment for sex, age, and BMI. Non-white race (OR=1.70, p<0.001) and being an immigrant (OR=2.40, p<0.001) predicted higher likelihood of sleep disorder symptom non-disclosure in patients without symptoms of OSA, but not in patients with symptoms of OSA, after adjustment for sex, age, and BMI.

Conclusion: Our findings indicate that patients with limited healthcare access should be considered more strongly for sleep health evaluation and that non-white and immigrant patients are less likely to discuss sleep health with a physician.

Support (if any):

Abstract citation ID: zsad077.0524

0524**EARLY CPAP ADHERENCE AS A PRIMARY PREDICTOR OF CPAP ADHERENCE AT ONE YEAR**William Hevener¹, Bretton Lane¹, Simba Nyanhongo¹, Dominic Munafu¹¹ BetterNight

Introduction: CPAP/APAP therapy remains the gold standard for treating OSA. Unfortunately, many patients struggle with long term CPAP/APAP adherence. Patients frequently have only

90 days to meet Medicare criteria for adherence to assure coverage of their CPAP/APAP therapy. Lack of adherence often leads to reevaluation, and a new trial of CPAP/APAP. Despite all of these efforts a significant number of patients are ultimately unsuccessful. When this process is drawn out over many months it can drain resources, time and patient motivation. We sought to determine if we could, during the first 30 days of CPAP/APAP therapy, identify those patients who were ultimately going to be unsuccessful.

Methods: A retrospective data analysis was completed on 7498 CPAP/APAP naive patients who began CPAP/APAP therapy in 2020-2021 with ResMed devices. Data was analyzed for percent of days with adherence (>4h/night) at 30 days, 60 days, 90 days, 180 days and 365 days. Additionally, AHI, sex, state, number of mask refits, and payor type (HMO, Medicare, self-pay, Medicare Advantage and Medicaid Advantage) were examined.

Results: Patients were 68% male. The age was 55.1±14.0 and AHI 29.8±25 (mean±SD). 1157 of the patients were < 10% adherent to CPAP/APAP (no more than 3 days >4h) during the first 30 days. Of the 1157, only 312 patients (27%) showed any use over 4h. The remaining 845 (73%) showed no CPAP/APAP use >4h during the first 30 days. At one year only 220 patients (19%) of the original 1157 showed any use over 4h. Of the 220 patients who showed any use >4h at year one, 83% were in the original 312 who showed any use >4h at 30 days. The other variables analyzed including AHI, sex, state, number of mask refits, and payor type were not independent predictors of long term adherence.

Conclusion: Patients with < 10% adherence at 30 days were unlikely to achieve adherence during one year of follow up. Identifying and intervening early in this population may facilitate ultimate CPAP/APAP adherence or the successful initiation of alternative therapies.

Support (if any):

Abstract citation ID: zsad077.0525

0525**EFFECT OF BODY POSITION AND SLEEP STATE ON OBSTRUCTIVE RESPIRATORY EVENTS DISTRIBUTION IN CHILDREN WITH DOWN SYNDROME**Surya Boopathy¹, Karim El-Kersh², Kahir Jawad¹, Egambaram Senthilvel¹¹ University of Louisville, ² University of Nebraska Medical Center

Introduction: The influence of body position and sleep state on obstructive respiratory events distribution in children with Down syndrome (DS) need further studies.

Methods: This was a single center, retrospective study that included children younger than 18 years old with DS who were evaluated for suspected sleep disordered breathing and underwent a full overnight polysomnography in an academic sleep disorders center over a period of 10 years. DS children with Obstructive apnea hypopnea index (OAHI) ≥ 1.5 were included in this study. Total OAHI, apnea hypopnea index (AHI) in different body positions and in different sleep stages including rapid eye movement (REM) and Non-REM (NREM) sleep were collected.

Results: A total of 158 children with DS met the inclusion criteria. The median age was 5 years (IQR 8.0---), 53.2% were male with a median BMI z-score of 1.2. Median times (%) spent in REM and NREM sleep were 17 % and 83% respectively. Median times (minutes) spent in different body positions were supine 194.1, left

side 53.5, right side 39 and prone 32. The overall median OAHl was 7.6, respiratory obstructive events were more common in REM sleep and in supine position. The median REM obstructive AHI was 20 events per hour (IQR: 10.1-34.5), whereas the median NREM AHI was 5.2 events per hour (IQR: 2.4-15 $p < 0.0001$). Similarly, supine obstructive AHI was 9.4 (IQR: 4.15 – 24.1) and off supine AHI was 2.4 (IQR 0-8.9 $p < 0.0001$). Only 24 out of 158 subjects had NREM predominant OSA. Age was a significant predictor of NREM predominant OSA ($P = 0.012$) compared to other factors such as gender, race, BMI, tonsillar grade, hypothyroidism and congenital heart disease. For every one year increase in age, the odds of having NREM predominant OSA was 14% higher than having REM predominant OSA.

Conclusion: Obstructive respiratory events in children with DS occur predominantly in REM sleep and in supine position. Non-REM predominant distribution of respiratory events was seen in older children with DS.

Support (if any):

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0526

EFFECT OF BODY POSITION AND SLEEP STATE ON SLEEP DISORDERED BREATHING DISTRIBUTION IN INFANTS AGES 6 TO 12 MONTHS

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Introduction: The effect of body position and sleep state on events distribution in infants ages 6 to 12 months needs further study. We aimed to study this distribution and determine the difference of body position in infants with and without sleep disordered breathing.

Methods: This was a single center, retrospective study that included infants ages 6 to 12 months who were evaluated for suspected sleep disordered breathing and underwent a full overnight polysomnography in an academic sleep disorders center over a period of 10 years. Infants with ages 6 to 12 months with obstructive sleep apnea hypopnea index (OAHl) and central apnea index (CAI) ≥ 1 (sleep disordered breathing [SDB] group) were compared with infants with normal AHI who represented the control group (CG). Total OAHl, CAI, apnea hypopnea index (AHI) in different body positions, rapid eye movement (REM), and Non-REM sleep were collected.

Results: A total of 36 infants had SDB and 18 infants had normal AHI. The median age was not significantly different between both groups with a median age of 10 months (IQR 7.75-11) in SDB group and 8.5 months in CG (IQR 7.25- 10.00) ($p=0.258$). Male sex was predominant in both groups (58.3% in SDB group and 61.1% in CG). There were no significant differences between both groups in the BMI, median total sleep time, REM% sleep time, and Non-REM% sleep time. The supine sleep time in the SDB group [258.90 minutes (IQR 149.35-381.25)] was significantly higher than the supine sleep time in the CG [165.90 minutes (IQR 54.55 to 285.05)] ($p=0.035$). In the SDB group, REM AHI [8.55 (IQR 5.02 – 15.25)] was significantly higher than Non-REM AHI [0.50 (IQR 0.30-1.20)] ($p<0.001$). In the SDB group, there were no significant differences in the supine vs. off-supine distribution of respiratory events.

Conclusion: Obstructive and central respiratory events in infants ages 6 to 12 months occurred predominantly in REM sleep compared to Non-REM sleep. Infants with SDB significantly spent more time in supine position when compared to infants without

SDB but the respiratory events distribution in infants with SDB did not have a significant positional distribution.

Support (if any):

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0527

EFFECTIVENESS OF HYPOGLOSSAL NERVE STIMULATION FOR OBSTRUCTIVE SLEEP APNEA AT A MAJOR TERTIARY ACADEMIC SLEEP CENTER

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Introduction: The use of hypoglossal nerve stimulation (HGNS) for treatment of obstructive sleep apnea (OSA) has been reported to be efficacious in up to 75% of patients with a 68% improvement in the 3% apnea hypopnea index (AHI). Based on these results, HGNS is an increasingly widespread alternative treatment for OSA patients who are intolerant of Positive Airway Pressure (PAP) treatment. It is unknown if HGNS is equally efficacious outside of the highly controlled setting of a clinical trial. Here, we performed a retrospective cohort study from patients who underwent implantation of a hypoglossal nerve stimulator at our academic institution and report the efficacy based on improvement in AHI.

Methods: Adult subjects with a diagnosis of OSA, who were intolerant of PAP therapy and underwent implantation of HGNS at Barnes Jewish Hospital in St. Louis, Missouri from 6/4/2019 to 6/28/2022 were included in this retrospective cohort study. Only those who were referred for implantation from Washington University Sleep Medicine Center were included. The efficacy of HGNS was evaluated by comparing the 3% AHI on subjects' polysomnography before and after the HGNS was implanted and activated. Analysis of the data was done using paired t-tests to determine efficacy of HGNS via a reduction of at least 50% of the 3% AHI and a reduction in 3% AHI to less than 20 events per hour.

Results: 45 subjects were implanted of which 1 subject did not tolerate HGNS, and 8 subjects were lost to follow-up. Of the remaining 36 subjects, the median 3% AHI decreased 79% from 29.5 to 6.5 events per hour ($p<0.0001$). There was a reduction of at least 50% of the 3% AHI in 83% of subjects and a reduction of 3% AHI to less than 20 events per hour in 86% of subjects.

Conclusion: HGNS achieved significant therapeutic results in the majority of patients with OSA who are intolerant of PAP therapy. These results add to the growing body of evidence reproducing the original clinical trial in a "real-world" setting free of any conflict of interest. Future studies examining predictive factors influencing the effectiveness of HGNS are needed.

Support (if any):

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0528

EFFECTS OF CONTINUOUS POSITIVE AIRWAY PRESSURE ON WHITE MATTER MICROSTRUCTURE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) has significant effects on quality of life and may lead to cognitive impairments. Continuous positive airway pressure (CPAP) is the standard

treatment for OSA, and has been shown to improve sleep disturbances and daytime dysfunction. In this study, we aimed to assess the effects of CPAP on white matter (WM) integrity using longitudinal diffusion tensor imaging (DTI) tests.

Methods: Twenty-two male patients with moderate to severe OSA were recruited and underwent DTI scanning before and 6-44 months after CPAP treatment. Sixteen male patients with untreated OSA who were not compliant with CPAP were included as a reference group. We compared the functional anisotropy (FA) values between baseline and follow-up MRI in both the CPAP and untreated groups using tract-specific statistical analysis (TSSA) method.

Results: The TSSA analysis showed that FA values in the middle part of the right CST were increased after treatment in the CPAP group. No significant change in FA value was observed between baseline and post-scan in the untreated group. In the CPAP group, the post-treatment FA value in the anterior part of the right ATR was significantly correlated with durations of CPAP therapy after controlling for age, body mass index, and baseline FA value.

Conclusion: Our study suggests that long-term CPAP treatment could gradually reverse OSA-induced injury to the WM microstructure, particularly WM associated with the motor and limbic systems. The study findings provide new insights into the mechanisms of cognitive improvement after CPAP treatment in patients with OSA.

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0529

EFFICACY OF A NOVEL ACCEPTANCE-BASED APPROACH IN IMPROVING PAP ADHERENCE IN WOMEN VETERANS

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Introduction: Sleep disordered breathing (SDB) is associated with a myriad of health conditions yet is often underrecognized in women. Positive airway pressure (PAP) therapy is first line therapy for SDB; however, adherence rates are low, with women in the U.S. having lower PAP adherence than men. In studies of veterans, published research has not evaluated interventions specifically for women with SDB. Acceptance and Commitment Therapy (ACT) is a technique that utilizes individuals' values, commitment to change, and mindfulness techniques to promote behavioral change and may be an effective technique in improving PAP adherence among women veterans.

Methods: We analyzed data from women veterans newly diagnosed with SDB who agreed to try PAP therapy (mean age=53.2 years [range 26-80], 30% African American, 28% Hispanic; n=90) who participated in a randomized controlled trial comparing an ACT-based intervention (Acceptance and Behavioral Changes to treat Sleep Apnea - ABC-SA; n=44) to a PAP educational

control (n=46). Remote monitoring was used to determine days of PAP usage, days PAP used > 4 hours (main outcome), and hours of PAP used per month for the first 3 months of use. We used mixed models to compare changes in PAP adherence measures between groups over the first 3 months of use.

Results: In the ABC-SA group, mean nights of use were 20.9, 14.9, and 11.5 for months 1, 2, and 3 respectively, versus 16.9, 11.0, and 8.7 in the control group, with a non-significant trend towards more nights of use in the ABC-SA group in month 1 (p=0.056). There were no significant differences between ABC-SA and control in other PAP use outcomes in months 1, 2 or 3.

Conclusion: An ACT-based approach did not improve PAP adherence in women veterans over the first three months compared to education alone. Future studies are needed to evaluate whether subgroups may benefit from more intensive interventions such as ABC-SA and to evaluate interventions for improving PAP use long-term.

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0530

EFFICACY OF OBSTRUCTIVE SLEEP APNEA TREATMENT BY A UNIQUE ORAL APPLIANCE AND EFFECT OF CONCURRENT MYOFUNCTIONAL AND CPAP THERAPY

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Introduction: Current treatment options for obstructive sleep apnea (OSA) include positive airway pressure, oral appliances, and upper airway surgery. The Day and Night Appliance (DNA) is a component of a dentist-guided system (Complete Airway Repositioning and Expansion [CARE], Vivos Therapeutics) that leads to gradual increases in upper airway volume. This study examines the effects of DNA treatment on OSA in patients before and after use of the device; we also examined how DNA treatment was impacted by concurrent myofunctional and CPAP therapy.

Methods: Data from a prospectively-collected clinical database (Vivos Airway Intelligence Service [AIS]) were reviewed, and 94 adult OSA patients who met DNA use criteria and had pre- and post-treatment sleep studies without the device in place were included. We compared the apnea-hypopnea index (AHI) and oxygen desaturation index (ODI) pre- and post-treatment using a paired t-test and fit linear regression models with change in AHI and ODI as dependent variables.

Results: Mean patient age was 47.8±14.7 years and 44.7% were men. Pre- and post-treatment sleep studies were conducted 15.2±7.0 months apart. 24.5% of patients were treated with DNA and myofunctional therapy (14.1% exclusively myofunctional, 10.4% myofunctional plus another treatment, e.g., tonsillectomy, frenectomy). 17.0% of patients were treated with CPAP (12.8% exclusively CPAP, 4.2% CPAP plus another treatment). For both pre-treatment and post-treatment, mean AHIs were 22.3±19.4 and 12.7±11.2 respectively (p< 0.0001) and mean ODIs were 11.6±13.7 and 7.8±9.1 respectively (p< 0.0001). Excluding patients who had undergone myofunctional therapy and another treatment modality and adjusting for patient age, BMI, and gender, we found myofunctional therapy was associated with a -10.4 change in AHI (p=0.038). However, myofunctional therapy

was not associated with a significant change in ODI ($p=0.905$). Concurrent CPAP use did not have a significant association with change in either AHI ($p=0.47$) or ODI ($p=0.61$).

Conclusion: This study shows that DNA use significantly improved post-treatment OSA severity, and that concurrent myofunctional but not CPAP therapy may result in further OSA improvement. An oral appliance system that provides palatal expansion with consequent improvement in OSA severity but does not require permanent nightly use has advantages over conventional oral appliances; however, further investigation is warranted.

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0531

EXCESSIVE MASK LEAK AND ITS ASSOCIATION WITH POOR PAP COMPLIANCE IN WOMEN. A SECONDARY ANALYSIS OF THE AWARE STUDY.

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Introduction: Studies have shown that continuous positive airway pressure (CPAP) adherence is lower in women. However, understanding of the specific challenges faced by women when starting therapy remains poor. Specifically, is there any relationship between leak and women's characteristics that could influence adherence?

Methods: The AWARE-study is a longitudinal pilot-study with the objective to identify in women modifiable barriers to initiating/adhering to treatment over 3-months. Adherence was considered when using CPAP for a minimum 4-hours 70% of the nights. But, is there any association between leak, mask type and other patient's characteristics that could influence adherence in women? This is a secondary analysis looking at leak as a consequence of poor adherence in women within the AWARE-study. We gathered data directly from the PAP-data-base and evaluated adherence within the first 3-months after starting therapy and usage at present-time. We investigated leakage (>25 L/min) and gathered information about severity of OSA, age, BMI, and race. Our aims: to evaluate for leak as a cause of poor adherence and to identify characteristics that could potentiate leak in women.

Results: Data from 49 women from the AWARE-study between the ages of 28-85, with a recent diagnosis of OSA who started CPAP was analyzed. Adherence, leakage, age, OSA severity, and mask type was gathered. Chi-squared test of independence suggests a relationship between leakage and present adherence, $\chi^2(1)=11.34$, $p=0.001$. Of those women experiencing high leakage, 83% were non-adherent to therapy. Logistic regression was run to compute an odds ratio with 95% CI. Those experiencing high leakage have about 92% times lower odds to still be compliant than those not experiencing high leakage [OR=0.08, 95% CI: 0.007, 0.478]. Overall, mask type relates to adherence, 72% of nasal mask wearers were still being adherent versus 38% when using facial masks. The prediction of adherence from leakage does not significantly differ across mask type. Age was found to be related to adherence; 57% of women under 50-years were not adherent to CPAP versus 26% in women over 50-years.

Conclusion: This information could guide us in suggesting strategies for better mask choosing and possibly to implement more specific strategies that can increase adherence in women.

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0532

GLOBAL PREVALENCE OF MILD OBSTRUCTIVE SLEEP APNEA IN FEMALES

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Introduction: CPAP has been shown to be beneficial in symptomatic mild OSA. While many healthcare systems have appropriate pathways for treatment of moderate-severe OSA, there remain questions on how to manage treatment optimally for the mild OSA population. Females with OSA tend to be milder than their male counterparts, with lower AHI, less oxygen desaturations, and different symptoms such as fatigue and insomnia. Females with mild OSA are at risk of being underdiagnosed and under treated. We explored global prevalence data to understand better the scope of this issue.

Methods: A recent publication contained estimations of the global prevalence and burden of OSA. This prevalence was calculated using sex and aged matched data from published prevalence studies, along with estimates for countries without prevalence data, a process which was done by matching the country to a similar country with prevalence data based on BMI, race, and geographical proximity. Finally, a newly developed conversion algorithm was used to standardize different scoring methodologies and to provide equivalent AHI. Raw data from this global prevalence exploration have been divided by sex, and then categorized based on the World Bank 2022 country income rankings, in order to estimate the prevalence of mild OSA in women.

Results: Data from adults aged 30-70 from 164 countries were included in this analysis. Data from 29 low-income countries were excluded due to insufficient information. Based on AASM 2012 scoring, it is estimated that globally at least 202,157,057 of 1,513,628,587 (13.4%) females have mild OSA. The prevalence of mild OSA was 14.6, 15.3, and 10.6% in females; compared to 23.5, 18.3, and 16.3% in males; in high income, upper-middle income, and lower-middle income countries, respectively. The prevalence of moderate-severe OSA was 9.9, 8.5, and 9.4% in females; compared to 22.2, 18.8, and 13.6% in males; in high income, upper-middle income, and lower-middle income countries, respectively.

Conclusion: Globally, mild OSA affects at least 202 million females (13.4%). The highest global OSA prevalence of 15.3% was seen in upper-middle income countries. Continuing awareness, education and appropriate treatment pathways are crucial to ensure this important group are not overlooked.

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0533

HEALTHCARE UTILIZATION BY PATIENTS WITH OBSTRUCTIVE SLEEP APNEA AND EXCESSIVE DAYTIME SLEEPINESS AFTER AIRWAY THERAPY IN THE UK

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Introduction: Obstructive Sleep Apnea (OSA) is a chronic condition characterized by repetitive episodes of upper airway collapse during sleep. Despite standard treatment with

continuous positive airway pressure (CPAP), some patients continue to experience residual excessive daytime sleepiness (rEDS). Pharmacotherapy use for rEDS is low in Europe and some wake-promoting agents are no longer allowed as treatments by the European Medicines Agency. The objective of this study was to characterize the patient demographics, comorbidities, medications, and healthcare resource utilization (HCRU) in a population of OSA patients with and without rEDS after CPAP initiation.

Methods: The retrospective observational cohort study used the Clinical Practice Research Datalink (CPRD) AURUM, a primary care database, linked at the patient level to the Hospital Episode Statistics (HES) database, which covers secondary care for all of England. The population included 10,746 adult OSA patients with a first record of CPAP treatment during the eligibility period (Jan 1, 2009-Mar 21, 2018). rEDS patients were identified 6 months after initiating CPAP treatment.

Results: Among all eligible OSA patients in the AURUM database, 596 (5.6%) had rEDS; 80.5% of rEDS patients were identified using recorded diagnosis code of daytime fatigue, and 21.7% using ESS score ≥ 11 (13 patients had both measures). A greater percentage of patients had a history of psychiatric (21.5%; $p < 0.0001$), gastrointestinal (7.7%; $p < 0.0001$), and neurodegenerative (13.6%; $p = 0.003$) disorders in the rEDS group, compared with the non-rEDS group, while the prevalence of obesity, cardiovascular, and sleep disorders did not significantly differ between groups. Across all patients, rates of prescription for stimulants or modafinil were low during the 12 months prior to CPAP initiation. Patients with rEDS had significantly higher HCRU compared to non-rEDS patients in the first and second years after CPAP initiation.

Conclusion: Despite low rates of rEDS identified in this study, the clinical needs of patients with rEDS are significant, as evidenced by the volume of HCRU, low use of pharmacotherapy, and high comorbidity rates, highlighting the need to improve patient care in rEDS.

Support (if any): Axsome Therapeutics and Jazz Pharmaceuticals

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0534

HOW OBJECTIVE SLEEP QUALITY WITH ODDS RATIO PRODUCT DIFFERS BY DIAGNOSIS OF COMISA, OSA, AND INSOMNIA.

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Introduction: Recent research has highlighted differences in sleep quality for comorbid insomnia and obstructive sleep apnea (COMISA). We investigated how COMISA affects objective sleep quality measured with odds ratio product (ORP) compared to individuals without insomnia or moderate to severe OSA.

Methods: 410 participants (age 46.4 ± 12.3 ; 174 females) recorded their sleep with in-home PSG using the Cerebra Sleep System and completed questionnaires. Sleep quality was measured using ORP derived from micro-analyzing frontal EEG channels. On the questionnaires, participants reported whether they experienced insomnia symptoms at least three times a week. Participants were classified as having no diagnosis if their RDI on the home PSG was < 15 and no insomnia symptoms. They were classified as insomnia only if they reported at least one insomnia symptom with an RDI < 15 . They were classified as OSA only if they had

an RDI ≥ 15 and reported no insomnia symptoms. Finally, they were classified as COMISA if they had an RDI ≥ 15 and reported at least one insomnia symptom. All analyses controlled for age and were corrected for multiple comparisons.

Results: 113(27.6%) patients were classified as having no diagnosis, 109(26.6%) as insomnia only, 83(20.2%) as OSA only, and 105(25.6%) as COMISA. There was a significant effect of diagnosis on ORPNREM ($F_{3,405} = 6.042$, $p < .001$) and ORPTRT ($F_{3,405} = 3.799$, $p = 0.010$). Participants with no diagnosis had lower ORPNREM than patients with OSA only ($p = 0.039$) and patients with COMISA ($p < .001$) and had lower ORPTRT than COMISA ($p = 0.009$). OSA severity based on the AHI was the only significant predictor of ORPNREM ($p < .001$, $\beta = 0.321$). Both AHI ($p < .001$, $\beta = 0.176$) and number of insomnia symptoms ($p = 0.002$, $\beta = 0.141$) were significant predictors of ORPTRT.

Conclusion: Participants with no diagnosis had the lowest ORP indicative of better sleep quality than participants with evidence of sleep disorders. Having COMISA may have greater impacts on sleep quality than insomnia symptoms alone. OSA severity was the only predictor of poor sleep quality when looking at ORPNREM. Yet both OSA severity and insomnia symptoms were associated with higher ORPTRT indicating that individuals with COMISA may show alterations of sleep quality in different states throughout the night.

Support (if any):

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0535

IMPACT OF HYPOGLOSSAL NERVE STIMULATION SURGERY ALONE ON SLEEP DISORDERED BREATHING AND SLEEPINESS

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Introduction: Hypoglossal Nerve Stimulation (HNS) is an established option for CPAP-intolerant obstructive sleep apnea (OSA) patients, with multiple studies demonstrating safety and effectiveness. There are known nightly variations in OSA severity. We aimed to determine if device implant alone (with therapy off) compared to baseline influenced sleep disordered breathing and daytime sleepiness.

Methods: This was a retrospective analysis of the STAR (Stimulation Therapy for Apnea Reduction) Trial, conducted from 2010-2016, that led to FDA approval HNS. Data was collected at a pre-implant screening, and post-implant prior to device activation (therapy off). Each visit included an attended polysomnography (PSG) and Epworth Sleepiness Scale (ESS). PSGs were scored by a central core lab.

Results: There were 126 participants (83% male), age 55 ± 10 years. The time between pre-implant baseline screening and device activation visit averaged 88 ± 29 days. BMI was 28 ± 3 at baseline and 28 ± 3 post-implant with therapy off. The pre and post-implant Apnea Hypopnea Index (AHI)s were similar (32 ± 9 vs 32 ± 9 events/hour, $p = 0.82$). The two-night AHI ranged from 13 to 65. The average AHI change between pre-implant and post-implant (therapy off) was -0.3 ± 17 events/hour. The Sher

20 response rate between pre-implant and post-implant therapy off was 13%. By comparison, previously published mean AHI with therapy activated was approximately 10-15 events/hour, and Sher 20 response rates ranged between 65%-75%. ESS pre and post-implant (therapy off) were similar (12 ± 5 vs 11 ± 5 , $p=0.09$), compared to ESS previously reported with HNS therapy activated (typically 6-7).

Conclusion: The STAR two-night baseline AHIs ranged between 13-65. While there were nightly differences in AHI in some patients, surgical implant of HNS with therapy off, did not result in meaningfully improvement in the AHI, Sher 20 response rate, or ESS.

Support (if any): Inspire Medical Systems

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0536

IMPACT OF POSITIVE AIRWAY PRESSURE THERAPY ON CLINICAL OUTCOMES IN OLDER VETERANS WITH COMORBID COPD AND OSA: AN UPDATE

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Introduction: Cognitive impairment in older Veterans is an independent predictor of subsequent mortality and disability. Pilot data indicate that patients with OSA-COPD Overlap Syndrome (OVS) may have reduced sleep quality, cognitive function and quality of life (QoL). However, there are no prior systematic studies evaluating treatment paradigms in patients with OVS. Our ongoing clinical trial is investigating whether positive airway pressure (PAP) therapy alleviates sleep disturbances, sleepiness, and improves cognitive function and QoL in older adults with OVS.

Methods: The design is a prospective parallel group randomized controlled trial in Veterans 60 years and older, with moderate-to-severe OSA with concomitant COPD (OVS). 225 eligible participants will be randomized to two treatment groups (PAP and conservative care) in 2:1 ratio for a duration of 6 months. Participants on the conservative care arm are required to follow good sleep habits and sleep hygiene, and on the PAP arm, in addition, are required to be adherent to PAP treatment (CPAP or Bilevel PAP, as required). Sleep questionnaires are administered to evaluate sleepiness, sleep quality, and general and disease specific QoL. Cognitive function is evaluated using Trail Making Test Part A and B, Paced Auditory Serial Addition Test, Stroop Task, Digit Coding, Hopkins Verbal Learning Test-R, Weschler Abbreviated Scale Intelligence II, Weschler Memory Scale IV, and Psychomotor Vigilance Test, respectively. All tests are administered at baseline visit, 3 months, and 6 months.

Results: In year-2 of the study, we have screened 7878 Veterans, enrolled 137 participants, randomized 34 participants (31 males, 3 females; age: 70.7 ± 6.6 years, BMI: 29.6 ± 6.7 kg/m², AHI: 47 ± 22 events/hr, spirometry FEV1: $60.8 \pm 11.7\%$ predicted, arterial blood gas (n=22) pCO₂: 41.2 ± 3.6 mmHg, ESS: 1.9 ± 2.4); 15 have completed the study per the protocol. Analysis of data will be completed at the end of the RCT.

Conclusion: Our research seeks to systematically study the effects of treating a novel target (OVS) to maximize daytime function and QoL, while also providing a framework for early treatment of mild cognitive impairment in vulnerable older Veterans.

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0537

INCIDENT HYPERTENSION PREDICTION IN OBSTRUCTIVE SLEEP APNEA USING MACHINE LEARNING

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Introduction: Obstructive sleep apnea (OSA) is associated with hypertension due to intermittent hypoxia and sleep fragmentation. Due to the complex pathogenesis of hypertension, it is difficult to predict incident hypertension associated with OSA. A Machine Learning (ML) model to predict incident hypertension identified up to five years after the diagnosis of OSA by polysomnography developed.

Methods: Polysomnography provides time-series data on multiple physiological signals. We used the sleep heart health study (SHHS) cohort, where 4,797 participants had OSA. After excluding participants with pre-existing hypertension at baseline, the sample size was 2,652. 1,814 participants with follow-up data at 5 years were included (911/1,814, 50% with incident hypertension). In addition to clinical data (i.e. age and race), features extracted from polysomnography (heart rate variability, HRV calculated based on the electrocardiography R-R interval), electroencephalography delta power, statistical information (i.e., mean and standard deviation of signals), and heart rate periodicity functions fed to support vector machine (SVM) ML model to train and validate. The polysomnography features were calculated over the 30-second epochs identified based on respiratory events and EEG arousal and respiratory events annotation, and their corresponding parts in other signals based on sampling frequency. Technical artifacts in oxygen saturation and ECG were reconstructed with the interpolation method and removed from the signal respectively. The SVM is a robust ML method trained in an iterative fashion to find the global optimum. In comparison to the Deep Neural Network (DNN) approaches, SVMs results are interpretable. Each polysomnography signal and its corresponding features were trained on a separate SVM, followed by a fusion of the SVM results. The final results were fused by voting of individual SVM results.

Results: The SVM ML model thus far has achieved a test accuracy (area under the curve, AUC) of 66.06%, sensitivity 63.21%, and specificity 68.9%.

Conclusion: This proof-of-concept study suggests that supervised ML models, such as the SVM, may be useful in predicting incident hypertension associated with OSA. Further research is required regarding optimal input features to boost the accuracy, followed by external validation of the model in additional OSA cohorts.

Support (if any): Research support 1R56HL157182, NIH/NHLBI

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0538**MARIPOSA: ORAL THERAPY AD109 IMPROVES OBJECTIVE & PATIENT REPORTED OUTCOMES IN OSA. RANDOMIZED, PLACEBO CONTROLLED CLINICAL TRIAL**

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Introduction: Obstructive sleep apnea (OSA) is a common disorder with often poorly tolerated treatment. While there is currently no approved pharmacotherapy for OSA, the combination of noradrenergic and antimuscarinic drugs, counteracting sleep-related upper airway muscle hypotonia, has recently shown encouraging results. AD109 is a combination of the norepinephrine reuptake inhibitor atomoxetine and the antimuscarinic aroxybutynin, the R-enantiomer of oxybutynin which recently showed efficacy over 1-night treatment in mild OSA patients. Safety and efficacy data over longer periods and in more severe OSA patients are needed.

Methods: Mariposa was a 25-center, randomized, controlled, parallel arms clinical trial designed to evaluate efficacy, safety, and tolerability vs placebo of 2 doses of AD109 (75/2.5mg and 75/5mg) and atomoxetine 75mg alone administered for 4 weeks in OSA patients with an apnea-hypopnea index (AHI4, 4% desaturation definition for hypopneas) between 10 and 45. The primary outcome was the change in AHI4, AD109 vs. placebo. Patient reported outcome questionnaires (PROMIS) were studied as exploratory outcomes.

Results: 211 patients (41% female) with median (IQR) age 55 (48-60) years and BMI 32.2 (28.0-35.2) kg/m² were randomized. AHI4 was reduced from 20.5 (12.3-27.2) to 10.8 (5.6-18.5) in the AD109 75/2.5mg dose arm and from 19.4 (13.7-26.4) to 9.5 (6.1-19.3) in the 75/5mg arm (both p< 0.0001 vs placebo). AHI4 was reduced from 19.0 (11.8-28.8) to 11.8 (5.5-21.5) with atomoxetine alone (p< 0.01 vs placebo) and from 20.1 (11.9-25.9) to 16.3 (11.1-28.9) on placebo. Overall, 44% had a reduction from baseline greater than 50% when treated with AD109. On AD109 75/2.5 dose, there was an improvement of PROMIS fatigue scores (p< 0.05 vs placebo and atomoxetine alone). Despite improving AHI4, atomoxetine alone reduced by 20+ minutes total sleep time vs placebo and AD109 (p< 0.05). There were no severe adverse events on AD109 with the most common side effects being dry mouth, insomnia, and nausea.

Conclusion: AD109 objectively and subjectively improved OSA severity in a group of patients with a wide range of AHI4 over 4 weeks of treatment. Results from the Mariposa trial are central for the design of phase 3 trials of AD109 in OSA.

Support (if any): This study was supported by Apnimed.

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0539**OAT DEVICE DESIGNS ARE NOT THE SAME WHEN IT COMES TO FDA ADVERSE EVENT REPORTS**

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Introduction: This investigation analyzes whether differences in OAT device designs are associated with different frequencies of adverse event reports (AERs).

Methods: Each AER identifies the OAT device used by the patient. Each OAT device was characterized using public information. Investigators utilized data from public sources, such as Frost & Sullivan, to estimate prevalence.

Results: Most frequently reported events were: allergic, swelling, rash and Pain/Discomfort. Only 2.5% of AERs pertained to dental side effects (tooth movements, bite changes). 98.5% of AERs involved OATs made from Lab Materials (acrylics, thermoformed polymers, nylons). 1.5% of AERs involved OATs made from engineered PMMA or Medical Grade Class VI polymers. OATs with Lab Formed materials were an estimated 22.6 times more likely to have an AER than those with Engineered Materials. Components (Herbsts, clasps, screws) comprised 55.6% of AERs. Elastomeric/Nylon Components (straps, bands, rods) comprised 42.4% of AERs. OATs with Monolithic Structures (no components) accounted for 2.0% of AERs. Compared with monolithic OATs, OATs using Metal Components and OATs using Elastomeric/Nylon components were 18.2 and 13.9 times more likely to have an AER. Anterior Clasps Mechanisms, Push Herbsts, Pull straps, bands, rods, 70-Degree Posts, and 90-Degree Twin Posts accounted for 45%, 42.7%, 6.1%, 5.6% and 0.6% of AERs respectively. Compared with 90-Degree Twin Post Mechanisms, Push mechanisms and OATs with Pull Mechanisms were 154 times and 146 times more likely to have an AER. Lab Formed OATs with Liners, Lab Formed Linerless OATs and Precision Engineered Linerless OAT devices accounted for 77.3%, 21.2% and 1.5% of events reported, respectively. OATs with Liners were an estimated 35.5 times more likely to have an AER than Precision Engineered Linerless OATs.

Conclusion: All OAT device designs are not the same when it comes to AERs. More AERs are associated with reactions. Dental side effects infrequently result in AERs. OAT devices that use Precision Engineered Materials, Monolithic Structures, 90-Degree Twin Posts and Precision Engineered Linerless designs are associated with lower frequencies of AERs. The results of this investigation suggest that medical guidelines and insurance coding should empower therapy providers with the flexibility to prescribe devices that are associated with fewer AERs.

Support (if any):

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0540**OBESITY IS LINKED WITH HIGHER RISK OF OSA WITHOUT SUBJECTIVE HYPERSOMNIA IN MENOPAUSAL WOMEN**

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Introduction: Obesity is one of the biggest public health problems in the world, with the incidence of obesity estimated to be around 30% in some countries. There is a well-established link between Obstructive Sleep Apnea and obesity. This is due to many factors including a narrower airway because of fat deposits in this region, as well as decreased muscle activity. Subjective sleepiness measured with the Epworth Sleepiness Scale (ESS) is also associated with an increased risk of OSA. There are some studies that suggest that the ESS has a better predictive value in men than in women to detect Sleep Disordered Breathing, but to our knowledge, there are no studies in menopausal women

Methods: A retrospective study was performed using the data from the menopause clinic at the University Hospital in Monterrey, Mexico. All patients in the menopause clinic are evaluated using a screening protocol to detect sleep disorders, using the following tools: Pittsburgh Sleep Quality Index (PSQI), STOP-BANG questionnaire, and the Epworth Sleepiness Scale (ESS).

Results: Data were collected from 89 menopausal patients, identifying a total of 36 patients (40.44%) that had a BMI equal to or higher than 30 kg/m². Of these 36 patients, 28 (77.7%) had a STOP-BANG questionnaire with 3 or more positive answers. Nevertheless, only 6 patients (16.6%) had an ESS of 10 or more with most having no subjective hypersomnia that was detected through this screening tool.

Conclusion: Subjective hypersomnia, which can be measured with the ESS, has been long considered an essential feature of OSA and is routinely used to screen different patient populations and decide whether a polysomnography or other sleep study is necessary for the diagnosis of OSA. Nevertheless, in menopausal women with obesity (BMI of 30 or higher), it seems that even though there may be an increased risk for OSA there is not an increase in subjective hypersomnia, which could lead to some patients with OSA not being studied properly. Better studies should be performed to get a better clinical picture of what OSA looks like in menopausal women.

Support (if any):

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0541**OBSTRUCTIVE SLEEP APNEA FOLLOWING VAGUS NERVE STIMULATOR IMPLANTATION: A META-ANALYSIS**

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Introduction: Vagus nerve stimulation (VNS) treatment for patients with intractable epilepsy has been shown to effectively lower seizure frequency and improve quality of life. However, due to stimulation of the vagus nerve, alterations in both central regulation of breathing and laryngeal muscle stimulation can precipitate obstructive sleep apnea (OSA). While there have been case reports describing OSA following VNS implantation, there has yet to be a detailed evaluation of this complication in a large cohort of VNS patients. The objective of this meta-analysis was to determine OSA rates in patients following VNS implantation.

Methods: English full-text articles were searched for on Pubmed, Scopus, and Embase databases. Articles had to follow patients before and after VNS implantation; report apnea-hypopnea index (AHI), respiratory disturbance index (RDI), or OSA rates following VNS implantation; be from a clinical trial, cohort, or case-control study. Two reviewers reviewed articles and a third settled disagreements. Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies were used. Following Freeman-Tukey transformation, the generic inverse variance method with random effects model was used for meta-analysis.

Results: Ten studies, seven retrospective and three prospective, representing a cohort of 306 patients were included in this study. Pooled OSA rates following VNS implantation were 27.3%, 95% CI: 15.1 - 41.5%. Subgroup analysis found no difference in rates between studies of pediatric populations (22.1%, 95% CI: 8.2 - 40.5%) and adult populations (31.9%, 95% CI: 18.9 - 47.5%) following VNS implantation ($P = 0.39$). There was significant heterogeneity in pooled analysis ($P < 0.00001$, $I^2 = 100\%$), but no inter-subgroup heterogeneity ($I^2 = 0\%$).

Conclusion: Obstructive sleep apnea is a common adverse effect following VNS treatment and patients should be monitored following implantation. There are no differences in OSA rates between pediatric and adult populations. Routine screening for OSA following VNS implantation may be a reasonable choice.

Support (if any): No institutional or NIH funding was received for this project

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0542**OBSTRUCTIVE SLEEP APNEA IN OUTPATIENTS WITH COPD AT CAN THO UNIVERSITY OF MEDICINE AND PHARMACY HOSPITAL – AN OBSERVATIONAL STUDY**Thu Vo Pham¹¹ Can Tho Medical and Pharmacy University

Introduction: The concurrence of obstructive sleep apnea (OSA) and chronic obstructive pulmonary disease (COPD) is generally identified as overlap syndrome. This study evaluated biometric characteristics, sleep disorders, and scores comorbidities on OS and OSA groups in outpatients at the Respiratory Units of Can Tho University of Medicine and Pharmacy Hospital (RU-CTUMP); surveyed respiratory symptom severity, airway obstruction, and aerosol treatment characteristics in OS patients; and determined the correlations between sleep disorder severity and specific patient characteristics.

Methods: A cross-sectional, single-center descriptive study was conducted. We enrolled 48 outpatients at the RU-CTUMP in the study in three months. The patients were divided into two groups with overlapped COPD and OSA (OS, $n = 30$) vs. OSA-only ($n = 18$). Patients were asked to complete the demographic questionnaires, Epworth Sleepiness Scale (ESS) scores, STOP-Bang questionnaire, and Snoring Severity Scale (SSS). They were assessed for pulmonary function tests (PFTs) to confirm their COPD diagnosis, overnight respiratory polygraphy (Nox T3x), and Apnea-Hypopnea Index (AHI) to evaluate the severity of OSA, Charlson index to evaluate comorbidities, and their medication history.

Results: In the OS group, 100% of the patients suffered from dyspnea with the mean mMRC scores of 2.83 ± 0.75 , mean FEV1 was $60.07 \pm 23.09\%$, and 86% received inhaled medicine. In both groups, all participants suffered from 1 - ≥ 2 comorbidities. Overlapped patients had more comorbidities than OSA-only patients (Charlson scores of 2.33 and 1.17, respectively). There were significant correlations between the AHI value and the body mass index, neck circumferences, STOP-Bang score, the value of the Snoring Severity Scale, and minimum SpO2 ($r = 0.45, 0.43, 0.46, 0.44, -0.69$, respectively). In addition, COPD was a risk factor for OSA (OR = 1.125).

Conclusion: Home sleep testing in outpatients with COPD in RU-CTUMP revealed an increased prevalence of OSA compared to the OSA-only group. One of the most common comorbidities in individuals with overlap syndrome is hypertension, which is at least as common as in sleep apneic-only patients and may contribute to the disease's overall severity and prognosis.

Support (if any):

Abstract citation ID: zsad077.0543

0543**OBSTRUCTIVE SLEEP APNEA, PLATELET AGGREGATION AND CARDIOVASCULAR RISK**Zanetta Kovbasyuk¹, Jaime Ramos-Cejudo¹, Ricardo Osorio¹, Ankit Parekh², Indu Ayappa², Omonigho Bubu¹, Andrew Varga², David Rapoport²¹ NYU Grossman School Of Medicine, ² Icahn School of Medicine at Mount Sinai

Introduction: Obstructive sleep apnea (OSA) affects pathways implicated in the pathophysiology of cardiovascular disease

(CVD) by poorly understood mechanisms. Platelets are key mediators of CVD risk and thrombosis and prior studies have suggested associations with OSA. We hypothesized that markers of OSA and platelet activity may be linked, and that these associations may be influenced by CVD risk factors.

Methods: Using one of the largest repositories of sleep phenotyping and platelet aggregation data available, we assessed the association of the apnea hypopnea index (AHI4%) and platelet aggregation in 482 participants dually enrolled within the Sleep Heart and Health (SHHS) and Framingham Heart Study (FHS) Offspring cohorts. Our primary outcome was the platelet aggregation response to adenosine diphosphate (ADP) 1.0 $\mu\text{mol/L}$ measured by light transmission aggregometry. Other stimulation doses and OSA-related measures were used as secondary for further validation. The relationship between the AHI and platelet aggregation was assessed using standard regression models adjusted for age, sex, years of education, BMI, smoking status, hypertension, diabetes, present CVD history, aspirin use, high-density lipoprotein (HDL) cholesterol, total cholesterol, and triglycerides. We also examined the influence of OSA and CVD-related factors such as age, sex, BMI, hypertension, OSA diagnosis (AHI4% ≥ 5), and the use of platelet modifying drugs.

Results: No associations were observed between the AHI and platelet aggregation. No associations were observed when stratifying by age ($< \text{vs. } \geq 65.0$), median BMI ($< \text{vs. } \geq 27.85$), hypertension (51.9%), or OSA diagnosis (47.1%). AHI was associated with platelet aggregation when stratifying by aspirin use ($\beta = 0.523$; $p < 0.001$; $n=65$). Associations were found in the same group of aspirin users for secondary exposures: hypoxic burden ($\beta = 0.358$; $p < 0.001$), minimum saturation ($\beta = -0.519$; $p = 0.026$), and the ODI3% ($\beta = 74.672$; $p = 0.002$).

Conclusion: Our study indicates that the AHI is not associated with platelet aggregation in the general population. Our finding that the AHI is strongly associated with platelet aggregation in participants who are on aspirin for primary prevention of CVD reinforces the need for further examining the mediator role of platelet activity in the association of OSA and CVD risk.

Support (if any):

Abstract citation ID: zsad077.0544

0544**OCCULT OBSTRUCTIVE SLEEP APNEA INCREASES RISK FOR DEPRESSION AMONG OLDER ADULT MEDICARE BENEFICIARIES**Jennifer Albrecht¹, Emerson Wickwire¹¹ University of Maryland School of Medicine

Introduction: Depression and obstructive sleep apnea (OSA) are highly comorbid, and each is independently associated with worsened health outcomes and increased economic burden. This study aimed to determine the effect of occult OSA on incident depression among a national sample of Medicare beneficiaries. We hypothesized that relative to non-sleep disordered controls, older adults with occult OSA would demonstrate greater risk for incident depression during the year prior to OSA diagnosis.

Methods: Our data source was a random 5% sample of Medicare administrative claims data from 2006-2013. Obstructive sleep apnea, depression, and medical comorbidities were defined using International Classification of Disease, Version 9, Clinical Modification diagnostic codes during the twelve months prior to OSA diagnosis. Beneficiaries with history of depression prior to the beginning of follow-up (12 months before OSA diagnosis)

were excluded. Non-sleep disordered controls were required to possess no evidence of sleep-related diagnosis, testing, or treatment during the study period. Log binomial regression was used to model risk for incident depression as a function of occult OSA. Inverse probability of treatment weights were used to balance covariates between exposure groups.

Results: The final sample included a total of 21,116 beneficiaries with occult OSA and 237,375 individuals without sleep disorders. In fully adjusted models, beneficiaries with OSA demonstrated significantly higher risk of depression during the year prior to OSA diagnosis (risk ratio 3.19; 95% confidence interval 3.00, 3.39).

Conclusion: In this national study of older adult Medicare beneficiaries, occult OSA was associated with three-fold risk of incident depression. Future research should 1) examine the disease burden including health and economic consequences, of comorbidity OSA and depression and 2) also seek to determine the effect of screening, assessing, and treating OSA on risk for depression.

Support (if any): This research was supported by an investigator-initiated grant from the ResMed Foundation to the University of Maryland, Baltimore (PI: EMW).

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0545

OPTIMIZING ACCESS TO ORAL APPLIANCES FOR OSA: DECREASE COST AND INCREASE AVAILABILITY WITH 3D PRINTING

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Introduction: Mandibular advancement devices (MAD) for obstructive sleep apnea have traditionally been a prohibitive therapy for a large number of patients due to high out-of-pocket expense and access to dentistry. This study examined if an increasingly more accessible and user-friendly technology, 3D printing, may provide a cost-effective in-office workflow to increase access to MAD use.

Methods: Available pricing data was sourced via PubMed articles searching keywords “oral appliance”, “sleep apnea”, “mad” and “cost”. Additional price point data was compiled from publicly available information from the largest dental insurance provider in the United States, Delta Dental. Computer Aided Design (CAD) software Fusion360 was used to prototype a MAD and Stereolithography (SLA) printing using FormLab’s 3B+ printer was performed by a University-run 3D printing lab.

Results: Traditional cost per MAD ranges from 400USD – 2,450USD with a mean of 933USD (based on the only available 1997 pricing data). The total cost of the one-off MAD used in this study was 150USD (consumable cost of 2.66USD, labor cost of 147.34USD). This excluded the one-time 3D printer cost of 3,750USD. At 1 device printed per day over 1 year, total cost per printed device would be estimated at \$22, which is 5% of the traditional cost of MAD. Total print time is estimated at 54 minutes, post processing time is estimated at 25 minutes, with a total MAD delivery to patient time of 1.3 hours.

Conclusion: Point-of-care 3D printed oral appliances are a feasible and inexpensive workflow to expand the use of MADs in

the treatment of mild to moderate sleep apnea. Multiple barriers remain in integrating this workflow into patient care, including integration with dentistry.

Support (if any):

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0546

PATIENT-REPORTED EXPERIENCE WITH A WIRELESS PATCH-BASED POLYSOMNOGRAPHY SYSTEM – RESULTS FROM A PILOT STUDY

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Introduction: Sleep is critical for health and wellbeing. Left untreated, sleep disorders negatively impact daily functioning and quality of life. The gold-standard for sleep monitoring and diagnosis is in-lab polysomnography (PSG). Though PSG provides a comprehensive overview of sleep, it is uncomfortable due to the amount of sensors, which prohibit movement and disturb sleep. A wireless patch-based PSG system, the Onera Sleep Test System (STS), consisting of four body-worn sensors, was recently introduced to overcome these limitations. The objective of this study is to evaluate patient-reported experience when using the Onera STS.

Methods: Forty-two patients were enrolled in Germany as part of an ongoing validation study. Participants were asked to fill in two questionnaires. The first, administered before the Onera STS sleep study, asked open-ended questions on their first impression of the device. The second, administered after the Onera STS sleep study, focused on the ease of use of the device and comfort of wearing it during the night using a 5-point Likert scale.

Results: Thirty-six patients completed the first questionnaire (85%) and 39 (93%) the second. First impression of the Onera STS was positive by 86% of patients. The size of the sensors was described as acceptable by 72%. Participants stated that the device looked more comfortable than in-lab PSG and they expected improved sleep quality and a more accurate diagnosis. After completing the PSG with the Onera STS system, 69% found wearing the four sensors comfortable, and no participant expressed strong discomfort during the sleep study. The Forehead sensor was considered the most comfortable (based on 77% stating strongly agree or agree), followed by the Abdomen sensor (74%), the Leg sensor (72%), and the Chest sensor (69%). Most participants (72%) expressed confidence in their ability to fit the sensors by themselves at home. Only one participant preferred to be supported by a technician for the application of the system.

Conclusion: The first impression of the Onera STS device were positive, and participants found it comfortable during sleep. The majority considered the application simple enough for unsupervised self-application, which can allow patients to undergo a PSG in the comfort of their own home.

Support (if any):

Abstract citation ID: zsad077.0547

0547**PHENOTYPING OF OBSTRUCTIVE SLEEP APNEA AND ITS DIFFERENCE IN MORTALITY**Min Cheol Seo¹, Jiyeon Shin², Kyung Hwa Lee³, Jeong Eun Jeon², Ha Young Lee², Cho Won Park², Sun-Young Kim⁴, Yu Jin Lee⁵

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Introduction: Obstructive sleep apnea (OSA), which is associated with a high mortality, is a heterogeneous disease that is affected by various pathophysiology. Although the severity of OSA is divided based on apnea-hypopnea index (AHI), AHI alone did not sufficiently represent these pathologies. The objective of this study is to categorize OSA using PSG data and compare the characteristics of each group including mortality.

Methods: 7,247 subjects were recruited at the Center for Sleep and Chronobiology, Seoul National University Hospital from June 2004 to December 2021. Demographic data, polysomnography, Sleep scale including Epworth sleepiness scale, Pittsburgh sleep quality index, Beck depression inventory, and Beck anxiety inventory were performed. After categorizing OSA using K-mean cluster analysis, Kaplan-Meier survival analysis and Cox proportional hazard regression analysis were used to evaluate all-cause mortality and hazard ratios.

Results: Three clusters were identified; Cluster 1 was associated with moderate OSA (mean AHI=19.28/h), high sleep efficiency and low arousal, Cluster 2 with moderate OSA (mean AHI=24.81/h), low sleep efficiency and high arousal, Cluster 3 with the most severe OSA (mean AHI=64.76/h), obese, and decreased O₂ saturation. Conventional classification of OSA showed no difference in mortality between group, whereas Cluster 1 and Cluster 3 showed significant higher all-cause mortality compared to not-OSA group (Cluster 1, Log rank $p=0.008$; Cluster 3 Log rank $p<0.001$). The risk of mortality was also significantly increased in cluster 1 (HR 2.048, 95% CI 1.265-3.317, $p=0.004$) and cluster 3 (HR 3.686, 95% CI 1.871-7.262, $p<0.001$). These results were also observed after adjustment for sex, age, BMI and comorbid disease (Cluster 1, HR 2.053, 95% CI 1.197-3.518, $p=0.009$; Cluster 4, HR 2.640, 95% CI 1.230-5.666, $p=0.012$).

Conclusion: Phenotyping of OSA considered multiple variables is more appropriate to predict mortality than conventional classification based on AHI. In addition to evaluate patient with severe

OSA, patients with moderate OSA who shows relatively good sleep and low arousal should be cautiously evaluated and monitored.

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0548**POSITION-DEPENDENT OBSTRUCTIVE SLEEP APNEA AND THE CARDIOVASCULAR RISKS**Christine Chow¹, Hyojung Kang², Jeongok Logan³, Min-Woong Sohn⁴, Heather Bonner³, Jennifer Lobo³, Younghoon Kwon¹

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Introduction: Position dependent obstructive sleep apnea (PdOSA) is highly prevalent, but the implication of PdOSA in cardiovascular (CV) outcomes has not been studied. We hypothesized that PdOSA is associated with lower risk of future CV events than those without PdOSA.

Methods: We included patients who underwent diagnostic polysomnography (PSG) at a single academic center. The study included patients with ≥ 2 hours of total sleep time, 30 minutes in both supine and non-supine sleep, and OSA (apnea hypopnea index [AHI] ≥ 5 /hr). We defined PdOSA as either POSA (overall AHI ≥ 5 /hr accompanied by supine AHI (sAHI) at least twice as high as non-supine AHI (ns-AHI)), or ePOSA (POSA criteria + ns-AHI < 5 /hr (i.e., normalized)). Blood pressure (BP) was derived by averaging multiple measures of clinic BP within 1 year of PSG. All patients were followed up to 11 years to identify incident CV events (including acute coronary syndrome, stroke, and new heart failure). We examined the association of PdOSA with CV events with a logistic regression, adjusting for age, sex, race, BMI, systolic BP, and OSA severity (mild [AHI 5-15] vs. moderate to severe [≥ 15]).

Results: A total of 1750 patients (mean age: 54 years, female 60%) were included. POSA and ePOSA were present in 47% and 23% of the cohort. Patients with either POSA or ePOSA were less obese and had less severe OSA compared with those without POSA and ePOSA. Patients with ePOSA had lower BP (systolic BP 128.8 vs 131.2 mmHg, $p=0.003$) than those without ePOSA. Over a median 8.3 years of follow-up, a total of 340 CV events occurred. In multivariable analysis, both POSA and ePOSA were associated with lower odds of future CV events (OR 0.8, 95% CI [0.64-0.99], $p=0.044$; OR 0.69 [0.52-0.89], $p=0.0061$, respectively). Analysis stratified by OSA severity showed that the ePOSA association was present only in those with mild OSA (OR 0.67 [0.48-0.94], $p=0.021$).

Conclusion: Among patients with OSA, PdOSA is associated with more favorable CV outcomes than those without PdOSA. The benefit appears to be limited to those with mild OSA. Future studies should compare the CV risks between PdOSA patients and those without OSA.

Support (if any):

Abstract citation ID: zsad077.0549

0549**POSITIVE AIRWAY PRESSURE FOR OBSTRUCTIVE SLEEP APNEA IN SYSTOLIC HEART FAILURE PATIENTS REDUCES HEALTHCARE RESOURCE UTILIZATION**

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Introduction: The prevalence of obstructive sleep apnea (OSA) is high in patients with systolic heart failure (HFrEF) and has been associated with poor prognosis in this patient population. The impact of positive airway pressure (PAP) therapy in patients with OSA and HFrEF remains unclear. This retrospective study sought to investigate the association between 1-year adherence to PAP therapy and healthcare resource utilization (HCRU) in patients with newly diagnosed OSA and comorbid HFrEF.

Methods: A national sample of administrative claims data linked to objective PAP therapy usage was used for this analysis. Included patients either had two healthcare encounters or one hospitalization with a systolic heart failure ICD-10 diagnosis code the year prior to being diagnosed with OSA and initiated on PAP therapy. HCRU was measured as a composite outcome of hospitalizations, and emergency room (ER) visits. Propensity score matching was used to create well-balanced groups with differing PAP adherence levels to assess the association with 1-year HCRU outcomes. Risk-adjusted models were used to generate the number needed to treat (NNT) that referred to the number of patients that need to become adherent to PAP from non-adherent to avoid 1 visit.

Results: We identified 3,182 patients with OSA and comorbid HFrEF, and after propensity score matching, 738 patients remained in each group (adherent vs. non-adherent). After 1 year of PAP therapy, adherent patients had fewer visits than non-adherent patients (0.92 vs. 1.15 visits per subject, $p = 0.006$), which was driven by a 24% reduction in ER visits for adherent patients. Composite hospitalization and ER visit costs were lower in adherent versus non-adherent patients (\$3,500 vs. \$5,879, $p=0.03$). The NNT for the entire cohort to avoid one visit was 1.5 patients.

Conclusion: HFrEF patients with comorbid OSA who were adherent to PAP therapy for 1 year have fewer composite hospitalizations and ER visits than patients that were not adherent. These results highlight the clinical and economic benefits of treating OSA in HFrEF patients.

Support (if any): Funding Source: ResMed

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0550**POSITIVE AIRWAY PRESSURE FOR OBSTRUCTIVE SLEEP APNEA IN DIASTOLIC HEART FAILURE PATIENTS REDUCES HEALTHCARE RESOURCE UTILIZATION**

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Introduction: Although diastolic heart failure (HFpEF) patients frequently have comorbid obstructive sleep apnea (OSA), which has been associated with poor prognosis, the impact of positive airway pressure (PAP) therapy remains unclear. This retrospective study sought to investigate the association between 1 year adherence to PAP therapy and healthcare resource utilization (HCRU) in patients with newly diagnosed OSA and comorbid HFpEF.

Methods: A national sample of administrative claims data linked to objective PAP therapy usage was used for this analysis. Eligible patients either had two healthcare encounters or one hospitalization with a diastolic heart failure ICD-10 diagnosis code the year prior to being diagnosed with OSA and initiated on PAP therapy. HCRU was measured as a composite outcome of hospitalizations and emergency room (ER) visits. Propensity score matching was used to create well-balanced groups with differing PAP adherence levels to assess the association with 1 year HCRU outcomes. Risk-adjusted models were used to generate the number needed to treat (NNT) that referred to the number of patients that need to become adherent to PAP from non-adherent to avoid 1 visit.

Results: 4,237 patients with OSA and comorbid HFpEF were included. With propensity score matching, 963 PAP adherent and 963 non-adherent patients remained. After 1 year of PAP therapy, adherent patients had fewer visits than non-adherent patients (1.16 visits per subject vs. 1.75, $p < 0.001$), driven by a 57% reduction in hospitalizations and a 36% reduction in ER visits for adherent patients. Total HCRU costs were lower in adherent patients than in non-adherent patients (\$12,732 vs. \$15,610, $p < 0.01$). Converting 1 patient from non-adherent to adherent would avoid 1.25 visits (either ER visit or hospitalization), with an NNT of 0.8.

Conclusion: HFpEF patients with OSA that are adherent to PAP therapy for 1 year have fewer hospitalizations and ER visits than patients that are not adherent. More importantly, HCRU costs were lower in adherent patients, highlighting the clinical and economic benefits of treating OSA with PAP therapy in HFpEF patients.

Support (if any): Funding Source: ResMed

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0551**PREDICTING DAYTIME ALERTNESS IMPAIRMENT IN OBSTRUCTIVE SLEEP APNEA**

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Introduction: Obstructive sleep apnea (OSA) reduces daytime alertness leading to social and occupational impairment. The Maintenance of Wakefulness Test (MWT), a gold-standard test for daytime alertness, is time-consuming and not routinely available in clinical practice. We examined EEG-based and clinical parameters derived from diagnostic polysomnography (PSG) as predictors of alertness impairment in adults with OSA.

Methods: Eighty-two participants with untreated OSA on diagnostic PSG (apnea hypopnea index, AHI ≥ 5 /hour), enrolled in a two-center clinical trial were included. The day following PSG, each participant completed four 40-minute MWT and four 10-minute Psychomotor Vigilance Tests (PVT). The outcomes were MWT mean sleep latency (MSL) and PVT lapses (reaction time ≥ 500 milliseconds, square root transformed). Three multiple linear regression models were used: 1. "standard predictors" (total sleep time, TST, percent REM and slow wave sleep, AHI, time $< 90\%$ oxygen saturation, and arousal index), 2. "novel predictors" derived by spectral analysis and averaged across right and left central EEG (normalized EEG power, odds ratio product; ORP parameters, and spindle characteristics), and 3. combined standard and novel predictors. Age, sex, and body mass index (BMI) were included in each model, and backward elimination (step AIC) was used for models 2 and 3.

Results: Participants were middle-aged (mean $\pm$ standard deviation, SD 53.5 ± 8.7 years), with moderate OSA (AHI 33.8 ± 18.2) and daytime sleepiness (Epworth Sleepiness Scale 11.7 ± 3.9), and 86% were men. The adjusted r^2 for MSL were: model 1=0.09, model 2=0.16, and model 3=0.27, and PVT lapses were: model 1=0.09, model 2=0.31, and model 3=0.34. For MSL, the significant predictors in model 3 included TST (t-statistic -3.59, $p=0.0007$), REM% (2.51, $p=0.01$), ORP-9 (2.95, $p=0.004$), ORP NREM (-3.15, $p=0.002$), spindle frequency (-2.95, $p=0.004$), and normalized EEG power (-2.59, $p=0.01$). For PVT lapses, model 3 predictors included 2.25-2.5 ORP% (-2.91, $p=0.005$), normalized EEG power (3.22, $p=0.002$), spindle power (-4.30, $p<0.0001$), spindle frequency (2.83, $p=0.006$), and sex (men vs. women, -2.56, $p=0.01$).

Conclusion: We have identified several novel PSG EEG-based predictors of impaired daytime alertness in OSA that will improve occupational evaluation and prognostication in OSA after future validation.

Support (if any): National Institutes of Health, UM1-HL112856, UL1TR001422, and UL1TR002003.

Abstract citation ID: zsad077.0552

0552**PREDICTIVE CHARACTERISTICS OF RUN-IN PERIOD ADHERENCE IN A RANDOMIZED CONTROLLED TRIAL**

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Introduction: The run-in period has been used in randomized controlled trials in obstructive sleep apnea (OSA) to assess continuous positive airway pressure (CPAP) adherence. We hypothesize that there are differences in participant characteristics and PAP adherence between those excluded after the run-in period and those included in the final analytic sample of the Sleep Apnea Stress Study (SASS, NCT00607893), a trial designed to examine effect of PAP treatment on intermediate cardiovascular outcomes.

Methods: The SASS trial was designed to include a 2-week run-in period with a 1-month wash-out period. Patients with CPAP adherence >4 hours of CPAP use for 70% of run-in period nights were randomized. Demographic factors were compared among groups using analysis of variance (ANOVA) or Kruskal-Wallis test in continuous variables, Pearson's chi-square test or Fisher's exact test was used for categorical variables. Bonferroni correction was applied for pairwise comparisons. SAS version 9.4 (The SAS Institute Cary, NC) was used to perform all analyses.

Results: Fifty-nine participants (30.8%) who did not meet PAP adherence threshold were excluded after run-in period and compared to Sham and CPAP treatment group ($n=74$ in each group). Results are presented as excluded vs sham treatment vs CPAP treatment. Participants excluded after the run-in period were more likely to be female than those who proceeded to randomization: 66% vs. 47% vs. 45%, $p=0.031$ and of Black race: 73% vs. 42% vs. 47%, $p=0.002$. Participants excluded after the run-in period and those non-adherent to treatment in sham and CPAP were younger than adherent participants: excluded: 48.9 ± 12.0 , sham non-adherent 49.7 ± 12.3 , CPAP non-adherent 47.7 ± 13.2 , sham adherent 58.3 ± 9.3 , CPAP non-adherent 54.3 ± 9.4 , $p=0.014$. In the run-in period, participants who were excluded had the median of number of days using the device 12 (IQR 7-15), mean of average daily use 2.8 ± 2.1 hours and median percent of days with 4+ hours use 18.2% (IQR 0-57.1%).

Conclusion: We identify that age and race are predictors of run-in period non-adherence to PAP therapy underscoring the need to develop pre-randomization PAP adherence optimization strategies specific to these subgroups to ensure representation in the trial.

Support (if any): This work was supported by NIH HL079114-02.

Abstract citation ID: zsad077.0553

0553**PREVALENCE OF INSOMNIA AND ANXIETY IN A NATIONAL SAMPLE OF PATIENTS WITH OBSTRUCTIVE SLEEP APNEA AND DEPRESSION**

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Introduction: Insomnia and anxiety are highly comorbid both with depression and with obstructive sleep apnea (OSA). This

retrospective study sought to characterize patients with these conditions among a national sample of individuals with depression and comorbid OSA.

Methods: A national sample of administrative claims data of OSA patients was used for this analysis. Included patients either had two healthcare encounters or one hospitalization with a depression ICD-10 diagnosis code the year prior to OSA diagnosis and before initiation on positive airway pressure (PAP) therapy for treatment of OSA. Anxiety, insomnia, and other comorbidities were identified by the presence of at least one ICD-10 code associated with healthcare encounters in the year prior to starting PAP therapy. Age, sex, and insurance coverage were characterized at the time of the first OSA diagnostic sleep test. Healthcare resource utilization was assessed for the year prior to starting PAP therapy.

Results: 36,668 patients with depression and comorbid OSA were included. 56% had comorbid anxiety, 28% had comorbid insomnia, and 35% had neither anxiety nor insomnia. Compared to those without anxiety or insomnia, patients with anxiety or insomnia were more commonly female (64% vs 57%) and had a higher prevalence of asthma (25% vs 20%), psychotic (14% vs 7%) and other mood disorders (24% vs. 14%), fibromyalgia (11% vs 7%) and GERD (43% vs 33%). Relative to individuals with insomnia or anxiety, patients without insomnia or anxiety experienced fewer ER visits, all-cause hospitalizations, depression-related hospitalizations, specialist visits, and self-harm events in the year prior to PAP initiation. Relative to patients with comorbid insomnia, those with comorbid anxiety demonstrated slightly higher healthcare resource use in the year prior to PAP initiation.

Conclusion: Anxiety and insomnia are prevalent comorbidities in patients with depression and obstructive sleep apnea, with more than half of patients suffering comorbid anxiety and a quarter of patients having comorbid insomnia. Future research should examine comprehensive patient care strategies that can be used in patients with comorbid anxiety or insomnia to encourage healthy sleep behaviors and successful acclimation to OSA treatment.

Support (if any): ResMed

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0554

RACIAL DISPARITIES IN HEALTHCARE RESOURCE UTILIZATION AMONG OLDER ADULT MEDICARE BENEFICIARIES WITH COMORBID OSA AND DEPRESSION

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Introduction: Depression and obstructive sleep apnea (OSA) are highly comorbid and independently associated with increased economic burden. Evidence suggests important racial disparities in diagnosis and treatment of each condition. This study sought to evaluate the economic burden of occult OSA among Black and White older adults with depression. We hypothesized that the impact of occult OSA on healthcare resource utilization would differ by race.

Methods: Data were derived from a 5% sample of Medicare administrative claims data. Inclusion criteria were age >64 years, 12 months continuous enrollment prior to OSA diagnosis, depression, and Black or White race. Undiagnosed OSA and pre-existing depression were defined using ICD-10

codes during the 12 months prior OSA diagnosis. HCRU was defined as monthly counts of inpatient, outpatient, and emergency department (ED) visits in each of the 12 months before OSA diagnosis. The relationship between undiagnosed OSA and HCRU was modeled using negative binomial regression. Inverse probability of treatment (IPT) weighting was used to balance covariates between groups. Effect modification by race was evaluated using an interaction term; estimates were stratified by race.

Results: Of 39,192 beneficiaries with pre-existing depression, 4,353 suffered undiagnosed OSA (n=325 Black adults, 7.5%). Relative to White beneficiaries with undiagnosed OSA, Black beneficiaries with undiagnosed OSA were more likely to be female (76.6% vs. 68.6%, p=.002) and to suffer multimorbidity (>7 comorbid conditions [71.7% vs 52.7%, p<.001]). In IPT weighted models and relative to Black non-sleep disordered controls, Black beneficiaries with undiagnosed OSA had higher inpatient (RtR 1.89; 95% CI 1.33, 2.71), outpatient (RtR 1.38; 95% CI 1.04, 1.83) and ED (RtR 1.83; 95% CI 1.22, 2.75) utilization. Relative to White non-sleep disordered controls, White beneficiaries with undiagnosed OSA demonstrated higher inpatient (rate ratio (RtR) 1.51; 95% CI 1.38, 1.65), outpatient (RtR 1.18; 95% CI 1.10, 1.26) and ED (RtR 1.45; 95% CI 1.34, 1.57) utilization. The interaction between race and undiagnosed OSA was significant in all models (p<.001).

Conclusion: Among Medicare beneficiaries with pre-existing depression, comorbid undiagnosed OSA is associated with increased HCRU across multiple points of service. The strength of this association is greater among Black (vs White) beneficiaries.

Support (if any): ResMed Foundation

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0555

SEX AND AGE DIFFERENCES IN RAPID EYE MOVEMENT RELATED OBSTRUCTIVE SLEEP APNEA

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Introduction: Rapid Eye Movement (REM) related Obstructive Sleep Apnea (OSA) is a subcategory of OSA in which apneas or hypopneas occur predominantly or exclusively during REM and may be more prevalent in women and children. There is no consensus on the definition. Here, we examine interactions of age and sex on diagnosis per definition.

Methods: Patients who underwent a PSG at the Sleep Service at NIH in a 24-month period were included. Four REM-OSA definitions used most in the literature represented the diagnostic criteria.

Results: 139 total participants (ages 1.5-76 y, 58 female) were evaluated. Twenty-eight men (20%) and eighteen women (13%) met criteria for at least 1 definition. Twenty participants (1.5-76 years) met definition one (9 female), 19 met definition two (9 female), 19 met definition three (9 female), and 36 met definition four (15 female). Fifteen of fifty-six (27%) pediatric patients (8 female) met criteria by at least one definition. Two female pediatric participants met definitions one, two and three, and all 15 pediatric participants met definition four. The average total AHI was 5.93 for women and 7.78 for men, while the average REM AHI was 17.96 (5.6-47.1) for women and 17.14 (5.3-51.7) for men. Twenty-six (18 female) REM-OSA patients had a total AHI of less than 5. For pediatric patients the average total AHI

was 3.56 for girls and 2.73 for boys, and the average REM AHI was 9.41 for girls and 8.29 for boys.

Conclusion: The prevalence of REM-predominant OSA is difficult to determine as there are multiple definitions in use. REM-predominant OSA has been associated with hypertension, poor glycemic control, and mood disturbance and may be underdiagnosed due to current guidelines. Current definitions of mild, moderate and severe apnea are based on total AHI over the course of the sleep period. In our study, more than half of participants with REM-OSA by any definition had a total AHI of less than 5, despite the high average REM AHI for both sexes. These patients would not have met criteria for a diagnosis of OSA which has clear treatment implications.

Support (if any): National Institutes of Health Intramural Research Program

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0556

SIMULTANEOUS COMPARISON OF UNEDITED AND MANUALLY EDITED HSAT WITH LEVEL 1 PSG IN PERSONS WITH HOSPITALIZED TBI

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Introduction: Previous studies have shown automatic scoring of portable level 3 sleep study provides similar findings when compared to polysomnography (PSG), establishing home sleep apnea tests (HSAT) as an adequate screening tool for OSA. Accuracy of level 3 studies with Nox T3 portable sleep studies (Noxturna Inc., Atlanta GA) may improve with manual editing to include total sleep time (TST). No other studies have compared unedited versus manually edited HSAT with level 1 in-lab PSG performed simultaneously. This study evaluates if added manual editing optimizes the diagnostic accuracy of HSAT in classifying the severity of OSA, using both AASM and CMS criteria.

Methods: Secondary analysis of six-center (n=206) sleep apnea diagnostic comparative effectiveness trial. Participants underwent simultaneous administration of level 1 PSG (Philips Alice 6 LDx Diagnostic Sleep system) and Nox T3 portable sleep study with centralized scoring using AASM and CMS criteria. All HSAT were autoscored and then edited by the registered polysomnographic technician. Editing entailed establishing start and stop recording times based on accompanying actigraphy data (reduction in movement) in the portable device and elimination of recording artifact.

Results: Using AASM criteria, poor sensitivity OSA (AHI $\geq$ 5) was observed using unedited vs PSG (p=.01) compared to manually edited HSAT vs. PSG (p=.06). No statistically significant difference was observed using AHI $\geq$ 15 or via categorization across four levels of OSA (none, mild, moderate, or severe). In contrast, CMS criteria comparisons to PSG showed poor specificity of OSA (AHI $\geq$ 5) for unedited (p=.003) compared to edited (p=.372) HSAT studies. As expected, total sleep time was overestimated using T3 actigraphy devices compared to the criterion standard across both edited and unedited studies (p=.001, .001 respectively).

Conclusion: Improvements in sensitivity and specificity of OSA were noted using edited versus unedited T3 HSAT when

compared to Level 1 PSG using both AASM and CMS criteria. Results support need for manualized editing of HSAT in persons with hospitalized TBI.

Support (if any): PCORI (CER-1511-33005), GDHS (W91YTZ-13-C-0015)

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0557

SLEEP APNEA DETECTION USING PHOTOPLETHYSMOGRAPHY USING WEARABLE ELECTRONIC DEVICES : A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Sleep apnea, a hyper common disorder is estimated to affect almost 1 billion people with the prevalence of more than 50% in some countries. It is almost impossible to do gold standard polysomnography for all the population for screening. Multiple studies have reported the use of cost effective wearable devices using photoplethysmography (PPG) for the screening. To our knowledge, we presented the first meta-analysis of all studies looking at PPG and screening of sleep apnea.

Methods: We conducted a systematic review and meta-analysis under the PRISMA guidelines. Study Eligibility criteria included patients aged > 18 without a prior diagnosis of sleep disorder. The intervention included screening using a wearable device using PPG with comparison using standard of care sleep study (e.g polysomnography). The databases used were Cochrane, PubMed, Embase and Google scholar. Search strategy with Boolean logic included Sleep apnea, wearable device, smart, photoplethysmography, PPG, smart and smartwatch. Outcomes were pooled diagnostic odds ratio, meta-analyzed area under the curve (AUC), and forest plots of sensitivity & specificity. Statistical analysis was done using the programming language R with R package meta. Fixed and random effects models were used to derive diagnostic odds ratio (DOR) and paired forest plots for sensitivity & specificity. Summary Receiver operation curve was made using proportional hazard model and Reitsma et al model with a bivariate approach.

Results: The search strategy revealed following number of studies: PubMed (270), Cochrane (0), Embase (41), and Google Scholar (728). Total of 12 studies were included. We found high DOR with the fixed effect model which was 28.979. Mean DOR with the random effects model was 27.6. Bivariate diagnostic random-effects meta-analyzed AUC was 0.902. Studies used various electronic devices some of which are commercially available such as E4 Wristband, Galaxy watch 4, Smartwatch GT2, Belun ring etc. 4 studies used PPG solely while others used multimodal data. 7 studies used conventional machine learning algorithm for analysis.

Conclusion: Screening of sleep apnea could be done in a cost-effective manner from commercially available devices using photoplethysmography owing to possible high sensitivity, AUC and DOR. More studies for data replicability and further standardization is needed.

Support (if any):

Abstract citation ID: zsad077.0558

0558**SLEEP BRUXISM AND SLEEP BREATHING DISORDER**JinKyu Han¹¹ Seoul Sleep Center

Introduction: Sleep bruxism (SB) is reported by 8-9% of the adult population and is mainly associated with rhythmic masticatory muscle activity (RMMA) characterized by repetitive jaw muscle contractions (3 bursts or more at a frequency of 1 Hz). The purpose of this study was to evaluate the relationship between the nature of sleep bruxism and the sleep breathing disorder.

Methods: We prospectively studied 32 patients who were referred to the clinical sleep apnea laboratory for study. They underwent standard nocturnal polysomnographic examination; in addition, masticatory activity was measured with a masseter electromyogram. Patients slept in the supine and lateral decubitus positions.

Results: Nocturnal clenching was higher in patients with higher respiratory disturbance index. 28 among 32 patients were included in the criteria of obstructive sleep apnea; average respiratory disturbance index (RDI) was 12.7. 280 clenches demonstrated in all patients.

Conclusion: We conclude that there is an association between sleep related breathing disorder and bruxisms that sleep position affects the incidence of both sleep disordered breathing and bruxisms, and that analysis of apneas and hypopneas and clenching events in both supine and lateral decubitus sleeping positions may be helpful.

Support (if any):

Abstract citation ID: zsad077.0559

0559**SOLRIAMFETOL DEMONSTRATES DURABLE COGNITIVE IMPROVEMENT IN ADULTS WITH OBSTRUCTIVE SLEEP APNEA AND EXCESSIVE DAYTIME SLEEPINESS**

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Introduction: Obstructive sleep apnea (OSA) is a common disorder characterized by repeated intermittent airway collapse—often a hypoxic event—resulting in disrupted sleep and excessive daytime sleepiness (EDS). Positive Airway Pressure (PAP) therapy reduces hypoxic events and mitigates sleep disruption, but EDS often persists. Cognitive impairment is a burdensome symptom in many patients with EDS associated with OSA, which leads to occupational and social dysfunction and degrades quality of life. Solriamfetol (Sunosi®) is approved to improve wakefulness in adults with EDS associated with OSA, but its effect on cognitive impairment was unknown. The SHARP study evaluated whether solriamfetol improves cognitive function in patients with OSA-associated EDS and impaired cognition, and the durability of cognitive effects across the day.

Methods: SHARP was a randomized, double-blind, placebo-controlled, crossover trial in 59 patients with OSA-associated

EDS and concurrent cognitive impairment. All patients received solriamfetol (75mg for 3 days followed by 150mg/day) for 2 weeks, and placebo for 2 weeks, with treatment periods separated by a 1-week washout. The primary endpoint was change from baseline on the Coding subtest of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), which is equivalent to the Digit Symbol Substitution Test (DSST). Secondary endpoints measured durability of effect spanning an 8-hour period and Patient Global Impression of Severity (PGI-S).

Results: The study completion rate was 96.7%. Solriamfetol treatment improved performance on the DSST-RBANS compared to placebo (6.49 vs. 4.75, $p=0.009$), with an effect size (Cohen's d) of 0.36. Solriamfetol also yielded improvements at post-dose timepoints throughout the day (solriamfetol-placebo difference): 2 hours (1.91, $p=0.033$), 4 hours (1.38, $p=0.089$; NS), 6 hours (2.33, $p=0.004$), 8 hours (1.58, $p=0.022$). Scores on the PGI-S improved with solriamfetol compared to placebo (-0.90 vs -0.61, $p=0.034$). The most common adverse events with solriamfetol treatment (incidence $\geq 3\%$) were nausea (6.9%) and anxiety (3.4%).

Conclusion: The adverse events profile and high completion rate suggest solriamfetol (150mg/day) was well tolerated. Moreover, solriamfetol improved cognition as measured by the DSST-RBANS, demonstrated durable effects over an 8-hour period, and reduced perceptions of symptom severity. Thus, in patients with OSA-associated EDS and impaired cognition, solriamfetol durably improved cognitive performance.

Support (if any): Axsome Therapeutics Jazz Pharmaceuticals

Abstract citation ID: zsad077.0560

0560**SOLRIAMFETOL FOR EXCESSIVE SLEEPINESS IN NARCOLEPSY AND OBSTRUCTIVE SLEEP APNEA: EFFECT SIZES AND NUMBERS NEEDED TO TREAT OR HARM**

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Introduction: Solriamfetol (Sunosi®), a dopamine/norepinephrine reuptake inhibitor that has been shown to activate TAAR1, is approved (US and EU) to treat excessive daytime sleepiness (EDS) in adults with narcolepsy (75-150mg/day) or obstructive sleep apnea (OSA) (37.5-150mg/day). Effect size, number needed to treat (NNT) and number needed to harm (NNH) are statistical representations of efficacy and tolerability that clinicians may find helpful in guiding treatment decisions. This analysis characterized these statistical parameters from two registrational studies.

Methods: We conducted a post-hoc analysis of data from two phase 3 studies in adults with excessive daytime sleepiness associated with narcolepsy (TONES 2) or OSA (TONES 3). Effect size compared to placebo, NNT, and NNH were calculated based on previously published endpoints, post-hoc analyses, and adverse events.

Results: On the Maintenance of Wakefulness Test, effect size compared to placebo (Cohen's d) was 0.29, 0.82, and 1.13 for 75mg, 150mg, and 300mg doses of solriamfetol in TONES 2 and 0.46, 0.89, 1.08, and 1.28 for 37.5mg, 75mg, 150mg, and 300mg in TONES 3. On the Epworth Sleepiness Scale (ESS), d was 0.47,

0.80, and 1.02 for 75mg, 150mg, and 300mg in TONES 2, and 0.42, 0.37, 0.99, and 1.04 for 37.5mg, 75mg, 150mg, and 300mg doses in TONES 3. NNT for patients achieving an ESS ≤ 10 was 7, 5, and 3 for 75mg, 150mg, and 300mg doses in TONES 2 and 8, 6, 4, and 3 for 37.5mg, 75mg, 150mg, and 300mg doses in TONES 3. On the Patient Global Impression of Change (PGIc), NNT was 4, 3, and 3 for 75mg, 150mg, and 300mg doses in TONES 2 and 16, 5, 3, and 3 for 37.5, 75mg, 150mg, and 300mg in TONES 3. Similar NNT were found for the Clinician Global Impression of Change as for the PGIc. In both TONES 2 and TONES 3, NNH pooled across doses for adverse events occurring in $\geq 5\%$ of patients and greater than placebo were all >10 , with the exception of headache in TONES 2 (NNH=6).

Conclusion: This post-hoc analysis demonstrates favorable effect size, NNT, and NNH values for solriamfetol in the treatment of EDS associated with narcolepsy and OSA.

Support (if any): Axsome Therapeutics

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0561

SOLRIAMFETOL REAL WORLD EXPERIENCE STUDY: SAFETY, EFFICACY, AND FOLLOW-UP FOR PATIENTS WITH OBSTRUCTIVE SLEEP APNEA IN GERMANY

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Introduction: Excessive daytime sleepiness (EDS) is a symptom of Obstructive Sleep Apnea (OSA) that can persist despite primary airway therapy and can be managed with wake-promoting agents. Solriamfetol (Sunosi®) is a wake-promoting agent approved to treat EDS associated with OSA (37.5–150 mg/day). This real-world study characterizes dosing/titration strategies among European physicians initiating solriamfetol and patient outcomes following initiation.

Methods: This is an ongoing retrospective chart review conducted by physicians in Germany and France. Data are reported from 52 German patients with OSA. Eligible patients (≥ 18 years old, diagnosed with EDS due to OSA, reached a stable solriamfetol dose, and completed ≥ 6 weeks of treatment) were classified into 1 of 3 groups based on solriamfetol initiation strategy: changeover (switched/switching from existing EDS medication[s]), add-on (added/adding to current EDS medication[s]), or new-to-therapy (no current/previous EDS medication).

Results: Patients' mean $\pm$ SD age was 50.0 $\pm$ 13.1 years; 65% were male. All patients used primary airway therapy. Obesity was the most common comorbidity (56%). New-to-therapy was the most common initiation strategy (n=39), then add-on (n=9), and changeover (n=4). The most common starting doses of solriamfetol were 37.5 (n=34; 65%) and 75 mg/day (n=17; 33%). Solriamfetol was titrated in 30 patients (58%); the majority were titrated within 7 days. Mean $\pm$ SD Epworth Sleepiness Scale (ESS) score was 15.5 $\pm$ 3.2 (n=52) at initiation and 10.7 $\pm$ 3.7 at follow-up (n=48), with a mean decrease of 5.0 $\pm$ 3.2 points. Across subgroups, mean ESS scores at initiation and follow-up ranged from 15.2–16.8 and 10.3–11.6, with mean decreases from 4.5–6.5

points. Improvements in EDS after solriamfetol initiation were reported for most patients (patient-reported, 90%; physician-reported, 88%). Most patients reported the effects of Solriamfetol to last ≥ 6 hours (81%) with no change in their night-time sleep quality (86%). Common adverse effects were headache, insomnia, and irritability.

Conclusion: These real-world data describe the use of solriamfetol in a cohort of German patients with OSA. Solriamfetol was typically initiated at 37.5 mg/day; titration was common. ESS improvements were greater than the minimum clinically important difference (MCID) of 2–3, and most patients and physicians perceived improvement in EDS. Common adverse events were consistent with those previously reported for solriamfetol.

Support (if any): Axsome Therapeutics and Jazz Pharmaceuticals

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0562

THE CHARACTERISTICS OF THE OLDER CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) USERS IN JAPAN: IN COMPARISON WITH THE ADULT USERS

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Introduction: The characteristics of the older CPAP users have not been well studied, and accessibility to medical care and long-term follow up are the issues about their investigation of the older OSA patients. In this respect, Japan is in a unique position to look into reality of the situation, as virtually all the people have unlimited access to medical care and CPAP follow-up with one to three month interval is mandatory. Under this condition, the aim of this study is to reveal the characteristics of the older CPAP users compared to the adult users.

Methods: This is a retrospective study dealing with 340 obstructive sleep apnea patients who started CPAP therapy from May 2013 to Oct 2021 in our sleep laboratory. Two groups of CPAP users were extracted from these patients, older (n=44, with the age of 70 years or more, 75.8 $\pm$ 4.4 years) and adult (n=26, with the age of 25–44 years old, 39.2 $\pm$ 4.5 years) patients. We assessed the characteristics of demographic data, symptoms and comorbidity, diagnostic polysomnographic parameters, and CPAP adherence.

Results: The older CPAP users were leaner (BMI, older/adult, 24.9 [21.9–26.8]/31.3 [27.1–34.8], $p < 0.0001$) and less sleepy (Epworth Sleepiness Scale, older/adult, 8.0 [5.0–13.0]/15.5 [8.8–20.2], $p < 0.0005$). Apnea-hypopnea index (AHI) of two groups were not significantly different (older/adult, 38.6 [27.4–48.0]/49.5 [26.4–66.4]). Most of both older and adult patients continued to use CPAP more than one year (84.1 % and 92.3 %, respectively). CPAP adherence using more than one year in the older group was higher than that in the adult group (older/adult, 96.5 %/80.0 %).

Conclusion: Our study revealed that CPAP adherence in the older users was higher than that in the adult users, although the older CPAP users were leaner and less sleepy.

Support (if any):

Abstract citation ID: zsad077.0563

0563

THE EVALUATION OF A REVOLUTIONARY CUSTOM-MADE ORAL APPLIANCE DESIGN ON EFFECTIVENESS, EFFICACY, AND COMPLIANCE

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Introduction: Evaluate the clinical effectiveness of the SomnoDent Avant with Bflex technology, a custom-made oral appliance therapy (OAT) device in the treatment of mild/moderate Obstructive Sleep Apnea (OSA) for naïve and PAP non-compliant patients. Hypothesis for the study was that the unique strap mechanism design of the appliance encouraged mouth closure and nasal breathing, would have high levels of effectiveness, particularly for supine sleepers. The evaluation of the initial fit of the device as well as patient's and bed partner's acceptance were also investigated

Methods: Prospective 90 day trial, participants age ≥ 18 with AHI of ≥ 10 to ≤ 30 events/hr. confirmed by using a WatchPAT, Home Sleep Apnea Testing (HSAT) device at baseline. Initial advancement of the lower jaw was 60%. Treatment effectiveness is derived from two endpoints: efficacy and compliance. The efficacy of the OAT is defined as the change from baseline in AHI, based on one and three-month HSAT. Efficacy was measured in supine, lateral and prone positions. Compliance data was obtained from the Dentitrac (BRAEBON Medical Corporation) chip embedded in the SomnoDent Avant device looking at usage for at least 4 hours per night for at least 5 out of 7 nights a week.

Results: Preliminary data from 50 participants (66% male, 35% female), age: 52.3 ± 11.8 yrs., BMI: 31.1. A statistically significant 3-month trend change from baseline AHI -11.0 ± 7 (37/37), Average usage: 7.0hrs/night, ESS: 3 month change from baseline -3.3 ± 4.0 (80.0% improvement), FOSQ 10: 1.7 ± 2.2 (76.7% improvement). Adequate (first-time) fit of the device upon initial insertion 89.3%, bed partner sleep improvement 83.3%, and 88.9% would recommend the use of the Avant OAT device.

Conclusion: • SomnoDent Avant demonstrated high effectiveness in the treatment of OSA, particularly with supine dependent OSA participants. The unique design of the Avant strap likely acts to close the patient's mouth, encouraging nasal breathing • Statistical improvement in the quality of life • Optimum first-time fit • Improvement in bed partner quality of sleep

Support (if any): SomnoMed

Abstract citation ID: zsad077.0564

0564

THE MECHANISM OF DEFICITS IN COGNITION OF OSA: PLASMA AMYLOID-BETA AND TAU PROTEIN LEVEL BY THE INTERVENTION DESIGN

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Introduction: Obstructive sleep apnea syndrome (OSAS) was shown to impair neurocognitive functioning, which was often

attributed to hypoxia and sleep fragmentation. More recently, increased accumulation of amyloid-beta and tau protein in OSAS patients have gotten research attention and have been considered to be a possible cause of neurocognitive impairments. Positive airway pressure (PAP) treatment has been found to improve cognitive functioning in OSAS patients. The current study further explored the association of the effects of PAP treatment on neurocognitive and plasma amyloid-beta (A β) and tau protein levels.

Methods: Sixteen OSAS patients (M:F=10:6; age average = 53.35, SD = 10.43) participated in the study. A package of neurocognitive tasks (CPT-III, verbal paired association task, PASAT-R, and semantic verbal fluency) were administered and blood sample was collected both before and after a 3-month period of PAP intervention. The total tau and A β 42 levels in the patients' plasma were quantified using an ultrasensitive immunomagnetic reduction assay.

Results: T-tests comparing cognitive performance before and after PAP treatment showed significant difference in total immediate recall score of verbal pair association task ($t = 3.412$, $p = .002$) and near significant differences in commission error on CPT-III ($t = -.357$, $p = .097$) and total score on PASAT-R ($t = 1.35$, $p = .099$). Other neurocognitive tasks as well as A β and tau proteins showed no significant changes. However, the change of A β after treatment correlated significantly with the improvement on the first immediate recall sequence ($r = -.64$, $p = .005$), and tau protein level correlated with the score on 2-sec-ISI subscale of PASAT-R ($r = -.45$, $p = .048$).

Conclusion: The present study showed that three months of PAP treatment was effective in improving immediate memory, but not in other cognitive functions or A β and tau protein levels. Moreover, some changes in memory and executive function were associated with decrease of A β and tau proteins. The preliminary results suggest that the neurocognitive impairment in OSAS patients might be partially associated with accumulation of A β and tau proteins. Future studies are needed to further confirm the findings.

Support (if any):

Abstract citation ID: zsad077.0565

0565

THE OBSTRUCTIVE SLEEP APNEA CPAP THERAPY COMPLIANCE; PROGRESSIONS, CHALLENGES AND INTERVENTIONS

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Introduction: Obstructive sleep apnea (OSA) is a common sleep disorder affecting 26% of the United States adult population and is associated with adverse health outcomes. Despite the advent of an array of treatment options, PAP remains the primary treatment modality for OSA since the approach was introduced in 1981. The objective of this systematic review is to determine how we can increase compliance to PAP therapy as the gold standard of OSA treatment.

Methods: A systematic review was conducted to study meta-analyses performed to determine the clinical significance of using PAP in several modalities, PAP initiation strategies, educational and behavioral interventions, tele monitoring, humidification, level of AHI, different mask interfaces, and flexible or modified pressure profile PAP to treat OSA in adults.

Results: Data demonstrated a clinically significant improvement in PAP adherence with the use of educational, behavioral,

troubleshooting, and telemonitoring interventions. Also systematic reviews show that nasal interfaces compared to oronasal interfaces have improved adherence and slightly greater reductions in OSA severity, heated humidification compared to no humidification reduces some continuous PAP-related side effects. Finally, AHI level of 15 and above but not demographic variables played a role in compliance.

Conclusion: All medical therapies have challenges with patient adherence. PAP therapy for OSA has unique challenges as available data indicate that optimal benefit is derived from continued use throughout the patient's sleeping period while clinical trials continue to demonstrate suboptimal group adherence ranging from 3–5 h/night. Given this, substantial work remains to be done to determine the optimal combination of strategies to maximize adherence. All researches on increasing adherence has evaluated outcomes at 3 months or less, despite evidence that usage continues to wane over time long-term. Evaluation of strategies to maintain adherence long term is a critical research priority. Other fields to focus are strategies for identification of patient-factors that place them at risk for nonadherence prior to PAP use, and the development and validation of specific algorithms to utilize with telemonitoring to identify nonadherent patients early after initiation of PAP. Comparative effectiveness studies will be needed to develop a comprehensive adherence program that can be deployed into routine clinical care.

Support (if any):

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0566

THE USEFULNESS OF APNEALINK™ AS A SCREENING TEST FOR DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA

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Introduction: To investigate the usefulness of ApneaLink™ as a screening test for obstructive sleep apnea by analyzing the correlation between ApneaLink™ and polysomnography (PSG).

Methods: From January 1, 2018 to December 31, 2020, patients who visited the sleep clinic with snoring, sleep apnea, and excessive daytime sleepiness at the otolaryngology department of this hospital were subjected to both standard sleep PSG and ApneaLink™. Correlations of Apnea-Hypopnea Index (AHI) and Respiratory Disturbance Index (RDI) in standard PSG with AHI and Risk Indicator (RI) in ApneaLink™ were investigated. To determine the usefulness of ApneaLink™ as a screening test for patients with moderate or severe sleep apnea, cut-off values of AHI and RI of ApneaLink™ were determined using receiver operating characteristic (ROC) curves.

Results: The correlation coefficient between AHI in PSG and AHI or RI in ApneaLink™ was both 0.647, showing a high positive correlation. The correlation coefficient between RDI in PSG and AHI or RI in ApneaLink™ was both 0.637, showing a high positive correlation. When the cut-off value of AHI with the ApneaLink™ test was 19.0, it showed a sensitivity of 76.29% and a specificity of 78.95%, which could be expected to produce more than 15 of RDI in PSG.

Conclusion: Through this study, it was found that ApneaLink™ could be used as a screening test for obstructive sleep apnea.

Support (if any):

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0567

TIRZEPATIDE FOR THE TREATMENT OF OSA: RATIONALE AND DESIGN OF THE SURMOUNT-OSA PHASE 3 TRIAL

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Introduction: Weight reduction is a standard recommended component of OSA treatment in people with obesity or overweight; however, the challenge to achieve and maintain weight reduction has limited its clinical application outside of the benefit established after bariatric surgery. Currently no FDA-approved anti-obesity medication (AOM) has demonstrated clinically meaningful improvement in OSA severity and symptomatology.

Methods: Tirzepatide is a single molecule GIP and GLP-1 receptor agonist. In SURMOUNT-1, a 72-week phase 3 clinical trial in participants with obesity or overweight, tirzepatide 15mg provided average reductions in body weight of 22.5% which occurred with beneficial effects on blood pressure, lipids, and physical functioning. In a linear meta regression model, we estimated that tirzepatide treatment would provide clinically meaningful apnea-hypopnea index decrease compared to placebo-treated participants with obesity and OSA. SURMOUNT-OSA, a placebo controlled 52-week, phase 3 trial, will investigate efficacy and safety of tirzepatide for the treatment of moderate to severe OSA (defined as AHI ≥15) in participants with obesity. SURMOUNT-OSA utilizes an umbrella master protocol and 2 Intervention-Specific Appendices (ISAs): ISA 1 includes participants with no current OSA treatment and ISA 2 includes participants using positive airway pressure therapy. Approximately 412 participants will be randomly assigned to placebo or tirzepatide across the entire master protocol, with approximately 206 participants in each ISA. While participants will receive tirzepatide or placebo based on a 1:1 randomization ratio, all participants will receive background lifestyle intervention for weight reduction.

Results: The primary endpoint for the individual ISAs is the difference in AHI response measured by polysomnography between tirzepatide and placebo arms at week 52. Secondary endpoints include hypoxic burden, functional outcomes and cardiometabolic biomarkers. The trial is utilizing a unique hierarchical functional outcomes endpoint based on Functional Outcomes of Sleep Questionnaire methodology. The trial employs wearables, such as home sleep testing and accelerometry to capture time to improvement as exploratory outcomes.

Conclusion: SURMOUNT-OSA aims to explore whether tirzepatide provides clinically meaningful improvement in obesity-related OSA by targeting an underlying etiology.

Support (if any): Eli Lilly

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0568**TRENDS IN OSA DISEASE SEVERITY OVER NEARLY TWO DECADES: UPDATE ON THE VA SAN DIEGO EXPERIENCE**Brandon Nokes¹, Tania Zamora², Cesar Cervantes-Gameros², William Perrine², Robert Barker², Carl Stepnowsky²¹ VA San Diego Healthcare System, ² Veterans Affairs San Diego Healthcare System

Introduction: The Veterans Health Administration (VA) is one of the largest integrated healthcare systems in the United States. Key risk factors for obstructive sleep apnea (OSA) include aging, weight, and male gender, all of which are highly prevalent in the VA population and help to explain the higher rates of OSA in the VA. The Pulmonary Sleep Program at the VA San Diego Healthcare System (VASDHS) started a patient database over twenty years ago for its home sleep apnea testing (HSAT) program. An analysis of ten years of diagnostic HSAT data was reported on over 12,500 patients in 2014. This analysis focuses on an update on the last four years and a comparison to 2014.

Methods: A retrospective review of the local clinical database of HSAT diagnostic testing was conducted. The database contained 8,928 sleep studies from 2018 to 2022. Invalid studies were removed. Only initial diagnostic studies were included.

Results: Of the 8,928 diagnostic studies, 2,564 tested negative for OSA (28.7%). Of the 6,364 positive cases, 43.3% were mild, 28.8% were moderate, and 27.9% were severe. The percentages of each OSA severity level were stable across these years (mild: 42%-45%; moderate: 27%-32%; and severe: 26%-29%). The mean AHI did not significantly change from 2018 (24.1+/-20.6) to 2022 (25.1+/-21.2) (overall mean 24.4+/-20.3; range: 5-140).

Conclusion: Based on this extensive retrospective review of diagnostic testing at a single, high-volume HSAT program, it appears that OSA severity levels have stabilized over these past five years, with the highest percentage of mild OSA cases (~43%) followed by moderate (~29%) and severe (~28%). Our facility saw a significant decrease in severe cases (60% to 30%) and increase in mild OSA (7% to 35%) from 2004 to 2013. Today, over 4 out of every 10 new OSA diagnoses are mild, which has significant treatment implications given that adherence to the two primary medical device options is suboptimal. Identifying patient-centered treatment options for these patients is a priority.

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0569**UPPER AIRWAY STIMULATION FOR OSA: A CASE SERIES OF PATIENTS DEVELOPING INTOLERANCE TO A PREVIOUSLY WELL TOLERATED SETTING.**Sravya Brahmandam¹, Lawrence Chan¹, Meena Khan¹, Margaret Chase¹¹ The Ohio State University

Introduction: Hypoglossal nerve stimulation (HNS) is an effective treatment for moderate to severe OSA in patients unable to tolerate PAP therapy. Longitudinal stability of HNS stimulation threshold has been reported. We report a series of 3 patients who

developed intolerance over time to previously tolerated and efficacious HNS settings necessitating adjustment to therapy.

Methods: Retrospective chart review.

Results: Patient 1 is a 49 y/o male with moderate OSA implanted with HNS in June 2019. Titration study February 2020 found 2.1V was optimal amplitude. He reported tolerance and benefit of this setting until July 2022. Tongue protrusion was assessed and found to be good at 1.3V. He subsequently tolerated 1.3V well, self-escalating to 1.6V at follow up in Oct 2022. HST is pending. Patient 2 is a 62 y/o female with severe OSA implanted with HNS in Nov 2019. At titration March 2020 3V was optimal amplitude. She reported tolerance and benefit of this setting until December 2021. Tongue protrusion was assessed and found to be good at 2.3V. At follow up April 2022 she reported good tolerance and benefit of 2.3V and HST in July 2022 showed an REI of 8.7. Patient 3 is a 61 y/o female with moderate OSA implanted with HNS in April 2021. At titration August 2021 1.5V was optimal amplitude. She reported tolerance and benefit of this setting until February 2022. Tongue protrusion was assessed and found to be good at 1.0V. HST April 2022 demonstrated an REI of 6.6 at 1V. The patient reported tolerance and benefit to therapy at this level.

Conclusion: Most patients demonstrate stability in HNS stimulation threshold over time, but we describe 3 patients who developed intolerance of a previously tolerated therapeutic setting. No patients reported changes in medical issues, medications, or weight loss as an explanation for developing intolerance. Possible etiologies include delayed nerve healing or change in nerve conduction over time. This may represent a source of potential non-adherence to therapy. Consideration for reduction in amplitude based on objective tongue protrusion may be an appropriate intervention for these patients. Adjustments to therapy should be followed by objective measures of efficacy.

Support (if any):

Abstract citation ID: zsad077.0570

0570**USE OF THE EXVENT ACCESSORY WITH THE O2VENT OPTIMA ORAL APPLIANCE FOR THE TREATMENT OF OBSTRUCTIVE SLEEP APNEA – A CLINICAL TRIAL**Sat Sharma¹, Antonella Conflitti¹¹ Centre for Sleep and Chronobiology

Introduction: The ExVent is an optional accessory to the O2Vent Optima mandibular advancement device (MAD) and provides oral Expiratory Positive Airway Pressure (EPAP). Oral EPAP with the ExVent is designed to provide upper airway support via similar mechanisms of action of nasal EPAP devices in commercial distribution, e.g., passive dilatation of the airway, which reduces flow limitation. Nasal EPAP devices are in commercial distribution as stand-alone therapies for the treatment of OSA. The oral EPAP provided by the ExVent accessory is designed to augment the OSA therapy provided by the O2Vent Optima.

Methods: This is a prospective, open-label, single-arm study conducted at 3 sites. Subjects who have been diagnosed with mild to moderate OSA (i.e., AHI ≥ 5 and ≤ 30) were included. Screening Phase The subjects completed a PSG study to obtain the baseline AHI and confirm a diagnosis of mild to moderate OSA Home Use Phase Subjects used the O2Vent Optima + ExVent for up to 3 months and logged usage hours. Subsequent to the Home Use Phase subjects underwent an in-lab PSG sleep night while using the O2Vent Optima + ExVent. Primary Effectiveness Outcome

Measure: Change in AHI between baseline and the AHI measured during the in-lab PSG sleep night using O2Vent Optima + ExVent. Safety Outcome Measure: Adverse events will be summarized descriptively in terms of type and frequency

Results: Patients with mild to moderate OSA were treated with Optima MAD and ExVent for 3 months at 3 different sites in North America. Preliminary data analysis demonstrated that treatment with Optima MAD and ExVent reduced AHI from $13.5 \pm 6.4/\text{hr}$ to $6.6 \pm 4.5/\text{hr}$ ($p < 0.05$), average 58% reduction in AHI. The lowest oxygen during sleep increased from $84.6 \pm 2.7\%$ to $88.6 \pm 2.9\%$ ($p < 0.05$). Overall success rate ($>50\%$ reduction in AHI) with treatment was 80%. During the trial patients on treatment with Optima MAD and ExVent demonstrated no excessive adverse events or device malfunction.

Conclusion: The clinical trial confirmed successful treatment with combined use of O2Vent Optima MAD and oral Expiratory Positive Airway Pressure accessory - ExVent in patients with mild to moderate OSA. Treatment was well tolerated with no excessive adverse effects.

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0571

UTILIZATION OF SELF-EFFICACY MEASURE OF SLEEP APNEA (SEMSA) QUESTIONNAIRE TO PREDICT CPAP ADHERENCE

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Introduction: The Self-Efficacy Measure for Sleep Apnea (SEMSA) is a self-administered questionnaire developed to assess pretreatment expectancies between obstructive sleep apnea (OSA) and continuous positive airway pressure (CPAP) therapy in adults. Higher values on the three sub-scales of the SEMSA suggest a greater perceived risk of having OSA, more positive beliefs regarding the outcomes of CPAP therapy, and a greater willingness to use CPAP. We examined the utility of the SEMSA in predicting CPAP adherence in a diverse urban population.

Methods: SEMSA was completed by patients presenting for polysomnography (PSG) over three months. We collected demographic data, body mass index (BMI), marital status, social vulnerability index (SVI), apnea hypopnea index (AHI), and 30-day adherence data from CPAP device download following the initiation of therapy. The outcomes were CPAP average usage per day in the first 30 days (minutes) and the percentage of days with usage over 4 hours. Stata v15 was used for multivariable linear and logistic regression analyses.

Results: One hundred eighty-eight patients completed the SEMSA, of which 101 were diagnosed with OSA and initiated CPAP. The study sample was middle-aged (mean $\pm$ SD, 52.5 ± 13.3 years), with variable OSA severity (AHI 44.8 ± 39.5) and high levels of obesity (BMI 39.5 ± 12.4) and racial diversity (61% Black, 10% White, 18% Hispanic, and 10% other), 47%

were men, and 33% were married. The multivariable models found that after adjusting for age, sex, race, marital status, SVI, ESS, and AHI, the SEMSA score was a significant predictor of average CPAP use (linear regression, $t\text{-statistic}=3.19$, $p=0.002$) and $\geq 70\%$ CPAP use of ≥ 4 hours per day (logistic regression, $t\text{-statistic}=3.23$, $p=0.002$, area under the curve; AUC=0.73).

Conclusion: The SEMSA score is a strong predictor of CPAP adherence in a diverse urban population. The patients with lower self-efficacy based on the SEMSA should be targeted for early CPAP adherence promoting education and interventions.

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0572

WEIGHT REDUCTION AND THE IMPACT ON APNEA-HYPOPNEA INDEX: A META-ANALYSIS

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Introduction: The occurrence of obstructive sleep apnea (OSA) is strongly associated with obesity. Behavioral, pharmacological, and surgical interventions that promote weight reduction can reduce OSA severity and improve other common obesity related complications and quality of life. While the relationship between weight reduction and apnea-hypopnea index (AHI) improvement has been documented, it does not seem to have been quantified adequately. The objective of this analysis was to quantify the association between percent change in body weight and percent change in AHI using results from the literature.

Methods: A literature search identified 13 studies with AHI and weight measurements before and after weight intervention in people living with obesity and OSA; 6 studies from bariatric surgery, 4 studies from diet and exercise intervention, and 3 studies from anti-obesity medications (including 2 placebo-controlled randomized clinical trials). A polynomial and a linear meta regression model as well as 95% prediction intervals were used to assess the relationship between % weight change from baseline and % change in AHI from baseline.

Results: Both the polynomial and linear models show, on average, weight reduction in patients living with obesity and OSA has a clinical benefit in reducing AHI. The linear meta-regression model that we developed suggests a mean AHI decrease of 2.6% per 1% weight reduction. As the prediction intervals are relatively wide, a precise relationship could not be established. For example, based on the linear model for a patient with 20% weight reduction we expect to see a mean 52.8% reduction in AHI with a 95% prediction interval (89.8%, 15.8%) AHI reduction.

Conclusion: Evidence shows that intentional weight reduction in people living with obesity and OSA results in improvements in OSA severity, and this was confirmed by our meta-analysis and modeling. The model shows that the degree of AHI improvement is dependent on the magnitude of weight reduction. However, establishing a precise relationship between percent change in AHI and percent weight reduction is challenging given the sparsity of data, variability in populations studied, and variability in AHI change following weight reduction.

Support (if any): Eli Lilly and Company

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0573

APPLICATION OF AASM CLINICAL SIGNIFICANCE THRESHOLDS TO ONCE-NIGHTLY SODIUM OXYBATE FOR IMPROVEMENT IN NARCOLEPSY SYMPTOMS

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Introduction: Once-nightly sodium oxybate (ON-SXB; FT218), an investigational, extended-release treatment, was evaluated for the treatment of narcolepsy in adults in the phase 3 REST-ON clinical trial (NCT02720744). The 3 co-primary endpoints, mean sleep latency on the Maintenance of Wakefulness Test (MWT), Clinical Global Impression-Improvement rating, and weekly number of cataplexy attacks (NCA), and the secondary endpoint of Epworth Sleepiness Scale (ESS) score were significant for ON-SXB vs placebo at weeks 3 (6-g dose), 8 (7.5-g dose), and 13 (9-g dose; all $P < 0.001$). These data were published after the cutoff for inclusion in the American Academy of Sleep Medicine (AASM) clinical practice guidelines for narcolepsy treatment; thus, REST-ON results were analyzed according to AASM clinical significance thresholds (CSTs).

Methods: Individuals with narcolepsy type 1/2 and age ≥ 16 years were randomized 1:1 to receive double-blind ON-SXB (4.5 g, 1 week; 6 g, 2 weeks; 7.5 g, 5 weeks; 9 g, 5 weeks) or matching placebo. For each dose (6 g, week 3; 7.5 g, week 8; and 9 g, week 13), least-squares mean (LSM) difference from placebo was calculated for change from baseline in mean sleep latency on the MWT, ESS score, and percentage reduction in NCA. As defined in the 2021 AASM guidelines, CSTs were the following changes vs placebo: MWT, ≥ 2 -minute increase; ESS, ≥ 2 -point decrease; and cataplexy, $\geq 25\%$ decrease in NCA.

Results: 190 participants (ON-SXB, $n=97$; placebo, $n=93$) were in the modified intent-to-treat population. On the MWT, difference in LSM change from baseline was 5.0, 6.2, and 6.1 minutes for ON-SXB 6, 7.5, and 9 g vs placebo, respectively. Differences in LSM change from baseline ESS scores were -2.1 , -3.2 , and -3.9 for ON-SXB 6, 7.5, and 9 g vs placebo, respectively. Differences in LSM percentage reduction in NCA were 26.0%, 34.2%, and 36.1% for ON-SXB 6, 7.5, and 9 g vs placebo, respectively.

Conclusion: Clinically significant improvement in excessive daytime sleepiness and cataplexy per AASM-established criteria was met with ON-SXB 6, 7.5, and 9 g doses. If FDA approved, ON-SXB will provide a once-nightly treatment for improving EDS and cataplexy in adults with narcolepsy.

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0574

ARTIFICIAL INTELLIGENCE TO AID IN DIAGNOSIS OF TYPE I NARCOLEPSY

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Introduction: Accurate diagnosis of Type 1 narcolepsy (T1N) is cumbersome – involving clinical, biological, and

electrophysiological components. Multiple sleep latency tests (MSLT) are central to diagnosis; however, current medications, sleep schedule, drug use, and testing environment can all compromise the interpretation of an MSLT. Incorrect MSLT results have devastating consequences for patients, including prolonged suffering from untreated T1N or adverse effects from unnecessary testing and therapies. Simple, accessible, accurate and cost-effective diagnostic solutions are needed. We evaluate automated methods to expand the diagnosis of T1N based on single night polysomnography (PSG).

Methods: The dataset included $N=225$ T1N patients and $N=455$ negative controls from 6 different cohorts. We evaluated two separate machine learning (ML) models for T1N detection: a supervised PSG-EEG based deep learning (PSG-DL) model focused on sleep microarchitecture, and a random forest (Sleep-RF) model based on traditional PSG report data. To measure performance, we calculated the area under the receiver operating characteristic curve (AUC-ROC) for each model and performed a feature importance analysis for the Sleep-RF model.

Results: AUC-ROC values were 0.960 and 0.878 for the PSG-DL and Sleep-RF models, respectively. Furthermore, the PSG-DL model produced a sensitivity and specificity of 84% and 94%, while the Sleep-RF model resulted in 75% and 83%. The feature importance analysis for the Sleep-RF model revealed these most important features: REM latency, sleep latency, total N3 time, and ratio of arousals in REM vs. non-REM.

Conclusion: ML methods automatically detected T1N in PSG-EEG with promising degrees of accuracy. These methods overcome common barriers to accurate diagnosis that can compromise the interpretability of an MSLT. Broad implementation of this method has potential to supplement the MSLT, increasing diagnostic detection rates and accuracy for T1N. Access to care can be broadened if T1N diagnosis were to occur anywhere a sleep EEG can be obtained, including the home setting, rather than being limited to in-center testing. This work has potential to further the developments of T1N detectors and assist in their widespread clinical adoption. Additional research is underway to help improve accuracy and ensure these methods are generalizable across platforms and clinical datasets.

Support (if any):

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0575

CATAPLEXY RESPONSE WITH FT218 (ONCE-NIGHTLY SODIUM OXYBATE): POST HOC RESPONDER ANALYSIS FROM THE PHASE 3 REST-ON CLINICAL TRIAL

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Introduction: In the phase 3 REST-ON trial (NCT02720744), participants with narcolepsy type 1 (NT1) treated with once-nightly sodium oxybate (ON-SXB; FT218), an investigational, extended-release formulation, had significant reductions in cataplexy episodes (ON-SXB vs placebo: 4.5 g, $P < 0.05$ [post hoc]; 6, 7.5, and 9 g, all $P < 0.001$). This post hoc responder analysis further characterized improvements in mean weekly cataplexy episodes in trial participants.

Methods: In REST-ON, participants aged ≥ 16 years with NT1/NT2 were randomized 1:1 to double-blind ON-SXB or placebo

for 13 weeks. Participants took 4.5 g (1 week), 6 g (2 weeks), 7.5 g (5 weeks), and 9 g (5 weeks). Participants with NT1 recorded number of cataplexy episodes per day (0, 1, 2, 3, 4, or ≥ 5) in a diary. Percentage of participants with $\geq 25\%$, $\geq 50\%$, $\geq 75\%$, and 100% reductions in weekly cataplexy episodes from baseline were compared (ON-SXB vs placebo; Fisher exact test).

Results: In the modified intent-to-treat population, 145 participants had NT1 (ON-SXB, $n=73$; placebo, $n=72$). Baseline mean (SD) number of weekly cataplexy episodes was 18.9 (8.7) for the ON-SXB group and 19.8 (8.9) for placebo. At week 1 (4.5 g), significantly more participants taking ON-SXB had $\geq 25\%$ reduction in cataplexy (43.8% vs 26.4%; $P < 0.05$). Significantly more participants receiving ON-SXB had $\geq 25\%$, $\geq 50\%$, or $\geq 75\%$ reduction in cataplexy vs placebo at weeks 3, 8, and 13 and complete resolution of cataplexy at weeks 8 and 13 (6-g dose: $\geq 25\%$, 68.5% vs 40.3% [$P < 0.001$]; $\geq 50\%$, 38.4% vs 20.8% [$P < 0.05$]; $\geq 75\%$, 23.3% vs 4.2% [$P=0.001$]; 100%, 2.7% vs 0 [$P=NS$]; 7.5-g dose: $\geq 25\%$, 67.1% vs 43.1%; $\geq 50\%$, 53.4% vs 25.0%; $\geq 75\%$, 32.9% vs 8.3% [all $P < 0.001$]; 100%, 6.8% vs 0 [$P < 0.05$]; 9-g dose: $\geq 25\%$, 58.9% vs 41.7% [$P < 0.001$]; $\geq 50\%$, 49.3% vs 26.4% [$P < 0.001$]; $\geq 75\%$, 32.9% vs 15.3% [$P < 0.01$]; 100%, 11.0% vs 2.8% [$P < 0.05$]).

Conclusion: In this post-hoc analysis, ON-SXB 4.5 g significantly reduced cataplexy by week 1. Additionally, $\sim 10\%$ of participants taking ON-SXB 7.5 and 9 g were free of cataplexy episodes. These data may be useful for clinicians when setting expectations of ON-SXB effectiveness for patients with cataplexy.

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0576

CHARACTERIZATION OF PATIENTS WITH NARCOLEPSY TREATED VS NOT TREATED WITH SODIUM OXYBATE: A PROPENSITY SCORE-MATCHED COHORT STUDY

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Introduction: Narcolepsy is a chronic sleep disorder with multiple comorbid conditions. Sodium oxybate (SXB) is strongly recommended for treatment of narcolepsy. This study used aggregate electronic health record (EHR) data to characterize demographic characteristics and comorbidities of patients with narcolepsy treated with or without SXB.

Methods: An EHR-based search identified first-time Mayo Clinic patients between 1975–2020. Patients had ≥ 1 narcolepsy-specific ICD-9/10 code and ≥ 1 diagnostic mention of narcolepsy in clinical notes (natural-language-processing algorithm). Patients with narcolepsy treated with SXB were age/sex matched with a cohort without SXB treatment. Common comorbidities were identified using ICD-9/10 codes and compared between cohorts (odds ratio [OR]).

Results: Of 4387 patients identified, 8% received SXB treatment ($n=351$; mean [IQR] age at first diagnosis code observed at Mayo Clinic, 32 [23.2–46.1] y; 65.5% female; 92.3% white); 4036 patients had no SXB treatment (mean [IQR] age at first diagnosis code observed at Mayo Clinic, 44.8 [29.8–59.0] y; 58.0% female; 88.9% white). The 10 most commonly reported comorbidities (overall population) were insomnia (46.6%), fatigue (46.3%), depression (42.2%), hypertension (36.2%), hyperlipidemia (34.2%), obstructive sleep apnea (32.3%), diabetes mellitus (31.3%), arrhythmia

(27.3%), idiopathic hypersomnia (IH; 26.8%), and coronary artery disease (17.6%). A cohort of 351 patients without SXB were age/sex matched to patients with SXB for comparison of comorbidities. In the unadjusted analysis, P values were significant for differences between cohorts (OR [95% CI] SXB vs no SXB) for fatigue (0.72 [0.54–0.97]; $P < 0.05$; adjusted $P > 0.9$) and IH (0.60 [0.43–0.84]; $P < 0.01$; adjusted $P=0.29$). After P value adjustment (Bonferroni correction), there were no significant differences between these cohorts in ORs for any comorbidity. The matched cohorts, which were younger than the overall population, had numerically lower rates of these diagnoses vs the overall population, except fatigue and IH in patients without SXB and depression in patients with SXB.

Conclusion: Among age-/gender-matched cohorts of patients with/ without SXB, there were no significant differences in comorbidities. Prevalence of comorbid IH/narcolepsy diagnoses highlight the diagnostic challenge in differentiating IH from narcolepsy type 2. SXB is highly effective but used by $< 1:10$ patients with narcolepsy in the Mayo Clinic health system.

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0577

CLINICALLY MEANINGFUL IMPROVEMENTS WITH PITOLISANT IN ADULTS WITH NARCOLEPSY: POOLED ANALYSIS OF RANDOMIZED CLINICAL TRIALS

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Introduction: Narcolepsy is characterized by symptoms indicative of sleep–wake dysregulation, notably excessive daytime sleepiness (EDS) and cataplexy. In 2021, the American Academy of Sleep Medicine (AASM) updated its clinical practice guidelines on the treatment of central disorders of hypersomnolence. The AASM identified clinical significance thresholds (CSTs) of a 2-point reduction in Epworth Sleepiness Scale (ESS) score and a 25% reduction in the frequency of cataplexy, amongst others, to compare posttreatment effects between intervention and placebo. This post hoc analysis evaluates the efficacy of pitolisant in the treatment of patients with narcolepsy using these updated CSTs.

Methods: Data were pooled from 2 randomized, placebo-controlled, 7- and 8-week studies (HARMONY-1, HARMONY-CTP) of pitolisant in adults with narcolepsy. Pitolisant was individually titrated over a 3-week period (maximum potential dose, 35.6 mg/day), and the dose remained stable thereafter. The analysis population for EDS included all patients who received pitolisant or placebo (ESS score ≥ 12 required for study inclusion). The analysis population for cataplexy included treated patients who experienced ≥ 3 attacks per week at baseline. The end-of-treatment value for the ESS was the score at the last study visit (last observation carried forward [LOCF]). The cataplexy endpoint was the weekly rate of cataplexy (WRC) during the stable dose period (LOCF).

Results: Data from 166 patients for EDS (pitolisant, $n=85$; placebo, $n=81$) and 122 patients for cataplexy (pitolisant, $n=64$; placebo, $n=58$) were analyzed. Mean (SD) baseline ESS score was 17.6 (3.0) in the pitolisant group and 17.9 (3.1) in the placebo group. Mean (SD) baseline WRC was 12.4 (10.7) and 9.9 (9.0), respectively. At the end of treatment, ESS score reduction of ≥ 2 points was observed in a significantly greater percentage

of patients in the pitolisant group (72.9%) as compared with the placebo group (45.7%; $P < 0.001$). The percentage of patients with a reduction in WRC of $\geq 25\%$ was significantly greater with pitolisant (78.1%) versus placebo (34.5%, $P < 0.001$).

Conclusion: Pitolisant provides statistically significant and clinically meaningful reductions in EDS and cataplexy in patients with narcolepsy, based upon the CSTs associated with the updated AASM clinical practice guidelines.

Support (if any): Bioprojet Pharma and Harmony Biosciences, LLC.

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0578

CLINICIAN AND PATIENT GLOBAL IMPRESSION IN A PHASE 2 STUDY OF MAZINDOL (NLS-1021) IN ADULTS WITH NARCOLEPSY TYPE 1 AND TYPE 2

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Introduction: Mazindol is the first partial orexin 2 receptor agonist and triple monoamine reuptake inhibitor in development for the treatment of narcolepsy. Clinician and Patient Global Impression (CGI and PGI, respectively) for cataplexy and excessive daytime sleepiness were assessed as secondary endpoints in the phase 2 (POLARIS, NLS-1021) multicenter study of mazindol ER in adult participants with narcolepsy type 1 (NT1) or type 2 (NT2) (ClinicalTrials.gov Identifier: NCT04923594).

Methods: Adults diagnosed with NT1 or NT2 who were washed out of narcolepsy medications at baseline were included into the study. Patients were treated with mazindol ER (NLS-2) at once-daily 2 mg for one week and once-daily 3 mg thereafter or matching placebo (PBO) on a 1:1 ratio. Throughout the study, CGI Severity (CGI-S) and PGI Severity (PGI-S) for cataplexy severity and excessive daytime sleepiness, respectively, were assessed and compared with scores at baseline. Both scales have five levels of severity: “None”, “Mild”, “Moderate”, “Severe”, or “Very Severe.”

Results: Sixty-seven participants were randomized (NT1 33.3% in NLS-2 group; 35.3% in PBO). At baseline, the mean CGI-S – Cataplexy was approximately 3.7 and CGI-S – Sleepiness approximately 3.4. Despite the small sample size, at the end of the double-blind (DB) period, the NLS-2 group demonstrated clinically and statistically significant improvements vs. PBO in both CGI-S – Sleepiness ($d = -0.7$, $p = 0.016$) and CGI-S – Cataplexy ($d = -0.8$, $p = 0.020$). At baseline, the mean PGI-S – Cataplexy was approximately 3.2 and PGI-S – Sleepiness approximately 3.7. At the end of the DB period, the NLS-2 group demonstrated clinically and statistically significant improvements vs. PBO in both PGI-S – Sleepiness ($d = -0.8$, $p = 0.007$) and PGI-S – Cataplexy ($d = -0.8$, $p = 0.023$).

Conclusion: Mazindol ER resulted in significant improvements of cataplexy severity and sleepiness in both conditions as rated by both clinicians and participants. These secondary outcome results support the efficacy of mazindol ER on cataplexy attacks,

in NT1 participants, and on sleepiness, in NT1 as well as in NT2 participants.

Support (if any): NLS Pharmaceuticals

Abstract citation ID: zsad077.0579

0579

LONG-TERM SAFETY OF ONCE-NIGHTLY OXYBATE FOR NARCOLEPSY: RESTORE STUDY INTERIM ANALYSIS OF DATA

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Introduction: The pivotal phase 3 REST-ON trial (NCT02720744) evaluated the efficacy and safety of once-nightly sodium oxybate (ON-SXB; FT218), an investigational extended-release formulation for treatment of adults with narcolepsy. In REST-ON, ON-SXB met its 3 coprimary endpoints: improvement in mean sleep latency on the Maintenance of Wakefulness test, Clinical Global Impression-Improvement rating (% much/very much improved), and number of weekly cataplexy attacks at all doses tested ($P < 0.001$ vs placebo). The safety profile of ON-SXB was consistent with that of immediate-release (IR) SXB. The ongoing RESTORE trial (NCT04451668) is an open-label/switch study evaluating the safety and tolerability of ON-SXB.

Methods: Participants aged ≥ 16 years with narcolepsy type 1 or 2 who completed the REST-ON trial, were on stable-dose (≥ 1 month) IR oxybate, or were oxybate-naïve are eligible for RESTORE. Initial doses were 4.5 g/night or equivalent/closest to the previous total IR oxybate dose/night for those switching; incremental adjustments (1.5 g/week; maximum dose, 9 g/night) were allowed. Safety data for participants receiving ≥ 1 dose of ON-SXB as of 01 July 2022 are reported here.

Results: This analysis includes interim data from 180 participants (REST-ON participants, $n=15$ [8.3%]; oxybate-naïve, $n=35$ [19.4%]; switch, $n=130$ [72.2%]). Most participants are white ($n=150$ [83.3%]) and female ($n=122$ [67.8%]); mean age is 35 years [range, 16–84]. Most participants who reported an adverse event (AE; $n=105$ [58.3%]) had AEs that were mild (61.9%) or moderate (32.3%) in severity. Three participants had serious AEs (abscess, deep vein thrombosis, rib fracture and pneumothorax); all were deemed unrelated to ON-SXB and all 3 participants continued in the study. Adverse drug reactions (ADRs; ie, AEs related/possibly related to study drug) were reported by 76 (42.2%) participants with 6 (3.3%) participants discontinuing ON-SXB owing to ADRs. ADRs occurring in $\geq 3\%$ of participants were nausea (11.7%), somnolence (6.7%), headache (5%), enuresis (5%), somnambulism (3.9%), dizziness (3.9%), tremor (3.9%), and vomiting (3.3%).

Conclusion: Interim data from the RESTORE study indicate that ON-SXB is generally well tolerated with a low rate of discontinuation owing to ADRs. If granted final FDA approval, ON-SXB will offer adults with narcolepsy a once-at-bedtime oxybate treatment option.

Support (if any): Avadel Pharmaceuticals

Abstract citation ID: zsad077.0580

0580**PATIENT EXPERIENCES WITH SODIUM OXYBATE THERAPY FOR NARCOLEPSY: A SOCIAL LISTENING ANALYSIS**

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Introduction: Narcolepsy is a disorder of hypersomnolence with intermittent periods of sleep, hallucinations, and sleep paralysis. Social listening (SL) analyzes real-world data on social media to provide information on disease symptoms and impacts to inform clinicians about a community's unmet needs. This research used SL with a proprietary artificial intelligence (AI) engine, which leverages natural language processing (NLP) to understand experiences of people living with narcolepsy treated with sodium oxybate (SO), a twice-nightly medication.

Methods: Using the proprietary AI engine to analyze text-based conversations, we evaluated 25,018 posts/comments from 15,280 participants which occurred from August 2011 to October 2022 from the subreddit r/Narcolepsy and a private Facebook group. Using a clinical entity recognition tagger, leveraging medicine ontology, conversations were filtered by mentions of (1) second dosage (e.g., second dose, 2nd) and (2) sodium oxybate (e.g., Xyrem, SO) to build a co-occurrence network for conversations discussing second doses of SO. Surveys and interviews were used to document patient SO experiences (Facebook, Discord channels, other networked contacts).

Results: Of 4275 subreddit users who mentioned SO, 398 (9.3%) communicated challenges with taking a second SO dose. The co-occurrence network revealed that second SO dose was co-mentioned with physical (e.g., nausea, headache) and mental (e.g., anxiety, depression, eating disorder) conditions. Of survey participants (N = 87 completed: patients, n = 85; caregivers, n = 2), 75% reported missing the second SO dose; effects included poor sleep quality, increased daytime sleepiness, mental health issues (especially depression), muscle spasms, work/school absences, and brain fog. Injuries resulting from waking to take the second dose (e.g., falls, stitches, concussions) were reported by 32%. Taking the second dose late (>4 hours after) was reported by 59% of patients. Effects of late dosing included grogginess, headache, and oversleeping, leading to school/work tardiness and missed responsibilities. When asked if a once-at-bedtime, premeasured SO dose would be safer, 76% of respondents agreed/strongly agreed.

Conclusion: The second nightly SO dose is associated with sleep-related issues for people with narcolepsy and their caregivers. Both the SL analysis and survey revealed that a missed/delayed second dose of SO decreased daily functioning, quality of life, and physical health.

Support (if any): Avadel Pharmaceuticals.

Abstract citation ID: zsad077.0581

0581**PATIENT PREFERENCES AND NOCTURNAL EXPERIENCES WITH OXYBATE THERAPY FOR NARCOLEPSY: RESTORE STUDY INTERIM ANALYSIS**

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Introduction: Sodium oxybate (SXB) is a standard-of-care treatment for adults with narcolepsy. Existing oxybate formulations are immediate release (IR), requiring patients to awaken for a second dose 2.5–4 hours after the first bedtime dose. Once-nightly SXB (ON-SXB; FT218), an investigational extended-release formulation, replaces this middle-of-the-night dosing with a once-at-bedtime regimen. RESTORE (NCT04451668) is an open-label/switch study evaluating the safety/tolerability of ON-SXB and patient preferences for ON-SXB or IR oxybate.

Methods: RESTORE includes participants aged ≥16 years with narcolepsy type 1 or 2 who completed the phase 3 REST-ON trial, were on stable-dose (≥1 month) IR oxybate, or were oxybate-naïve. Initial doses for participants switching from IR oxybate are equivalent/closest to the previous total dose/night; incremental adjustments (1.5 g/week; maximum, 9 g/night) are allowed. A nocturnal adverse event (AE) questionnaire about switch participants' IR oxybate experience in the previous 3 months was completed at baseline. Switch participants completed the preference questionnaire after 3 months of ON-SXB treatment.

Results: Data available from preference questionnaires (n=78) and nocturnal AE questionnaires (n=130) were analyzed at the interim data cutoff (01 July 2022). Most common AEs thus far were nausea, headache, and somnolence. The once-nightly dosing regimen was preferred by 93.6% (73/78) of participants. The second nightly IR oxybate dose was unintentionally missed in the previous 3 months by 65.4% (85/130) of switch participants; 80.2% (73/91) who intentionally and/or unintentionally missed the second dose felt worse the next day. Participants who took their second nightly IR oxybate dose >4 h after the first dose (51/130 [39.2%]) reported being somewhat, quite a bit, or extremely groggy/unsteady the next morning (26/51 [51.0%]). Inconvenience of the second dose was reported by 70.8%. Other issues related to the second dose were anxiety (29.2%) and the need to be woken by someone else (23.1%). In the past 3 months, 118 participants (90.8%) arose from bed after waking to take the second dose; 9 of these participants reported having fallen, with 5 reporting injuries.

Conclusion: These interim RESTORE data demonstrate patient preference for once-at-bedtime dosing of ON-SXB and indicate treatment burden associated with twice-nightly IR oxybate.

Support (if any): Avadel Pharmaceuticals

Abstract citation ID: zsad077.0582

0582**POLYSOMNOGRAPHY PARAMETERS PREDICT MEAN SLEEP LATENCY TEST RESULTS USING MACHINE LEARNING**Matheus Araujo¹, Laura Mora-Munoz¹, Noah Andrews¹, Nancy Foldvary-Schaefer²¹ Cleveland Clinic, ² Sleep Disorders Center, Neurological Institute, Cleveland Clinic

Introduction: The mean sleep latency test (MSLT) objectively measures mean sleep latency (MSL) and sleep onset during REM periods (SOREMPs) in the absence of external alerting factors used for diagnoses of central hypersomnolence disorders. Polysomnography (PSG) is routinely performed the night before an MSLT. We explored the use of PSG variables at the individual level to predict MSL and SOREMPs assisted by machine learning methods. **Methods:** 802 PSG/MSLTs from 796 patients (75% female, age 34 years [SD:12.1], BMI 27.9 [SD:7.6], ESS 13.9 [SD:4.9]) performed at Cleveland Clinic Sleep Disorder Center from 2012 to 2022 were included. We used 5-fold cross-validation experimental settings where five types of machine learning models (logistic regression, support vector machine, multilayer perceptron, random forest, XGBoost) were trained for two separated binary classification tasks: predict MSL < 8 minutes (343 out of 802) and SOREMP >= 2 (234 out of 802). Within each fold, we performed a feature selection analysis on the training set in 39 PSG and demographic variables based on Analysis of Variance (ANOVA) with $p < 0.05$. A random search approach with 1000 combinations was used for machine learning hyperparameter tuning. The area under the ROC (AUC-ROC) score was used to rank the methods based on the test set of each fold (mean + SD). We retrained the best machine learning configuration in a new single train/test (80%/20%) split to evaluate the top 5 features that were more relevant to the best model by computing their Shapley Additive Explanations values (SHAP). **Results:** XGBoost had the best average AUC-ROC for predicting MSL of 0.71 ± 0.04 . Its most important features out of 14 selected were total recording time, percentage of sleep time, total wake time after sleep onset, non-supine sleep time, and sleep efficiency. Random forest was the best for SOREMP prediction with AUC-ROC of 0.75 ± 0.05 , and the most important features were REM latency, age, and Epworth Sleepiness Scale score, percentage of time on REM, minimum oxygen saturation, out of 13 selected. **Conclusion:** PSG the night prior to MSLT provides predictive information that can be leveraged to anticipate MSLT results on the individual level. This work provides the foundation to better identify patients with central hypersomnolence disorders. **Support (if any):**

Abstract citation ID: zsad077.0583

0583**PREVALENCE AND INCIDENCE OF NARCOLEPSY IN THE US GENERAL POPULATION**Maurice Ohayon¹, Marie-Lise Cote²¹ Stanford University School of Medicine, ² Centre d'Evaluation et de Statistique

Introduction: Narcolepsy is a sleep disorder characterized by cataplexy, hypersomnolence, sleep fragmentation and

manifestations of various REM sleep abnormalities. It is a rare orphan disorder and therefore, its prevalence is almost exclusively estimated by derivate from clinical samples. Consequently, the objective of this study was to assess the prevalence of narcolepsy in an US general population representative sample.

Methods: The epidemiological study was carried with 15,927 individuals from 15 US States using the Sleep-Eval system. The longitudinal study was in eight of these 15 states: 12,218 subjects were interviewed by phone during the first wave and 10,931 at the second wave three years apart. Prevalence rates were calculated with the large sample while the Incidence was calculated on the subjects who participated in both interviews (N=10,931). The same interview was completed in both waves. For the purpose of this study, an algorithm was created using the answers provided for each symptom to reach a diagnosis conclusion of Narcolepsy type 1 (NT1) or Narcolepsy type 2 (NT2) according to ICSD3.

Results: NT1 was identified in 0.0126% (95% CI: 0.000%-0.03%) of the whole sample. Prevalence was similar between men and women. NT1 did not differ significantly by age groups although it was slightly higher in individuals younger than 35 y.o. (0.0201% (95% CI: 0.000%-0.06%)) compared to 0.016% (95% CI: 0.000% to 0.047%) in the 35 to 54 y.o. group and none in the oldest group. NT2 was observed in 0.0251% (95% CI: 0.0005%-0.0497%) of the sample. NT2 prevalence was comparable between men and women and among age groups. Overall, 66.7% of narcolepsy individuals in the sample identified by Sleep-Eval were already diagnosed as such by a physician. The incidence rate was also very low at 0.0026% per year.

Conclusion: Our results support the fact that narcolepsy is indeed a rare disorder affecting 37.7 individuals per 100,000 inhabitants with a relatively low incidence at 2.6 individuals per 100,000 inhabitants per year. Recognition of the disorder by a physician was relatively high in the United States with 2/3 of the cases being already diagnosed.

Support (if any): Data analysis study were funded by Tris Pharma and Takeda Pharmaceutical Company.

Abstract citation ID: zsad077.0584

0584**SODIUM OXYBATE TREATMENT PATTERNS IN NARCOLEPSY PATIENTS: A PROPENSITY SCORE-MATCHED COHORT STUDY SUBANALYSIS**Lois Krahn¹, Melissa Lipford¹, Gajinder Pal Singh²,Shahir Asfahan², J. Layne Moore¹, Maja Tippmann-Peikert¹,Praveen Kumar-M², Wui Ip², Samir Awasthi², Jennifer Gudeman³¹ Mayo Clinic, ² nference, ³ Avadel Pharmaceuticals

Introduction: Sodium oxybate (SXB) is strongly recommended for treatment of narcolepsy. Patients treated with available immediate-release oxybates are required to awaken for a second dose 2.5–4 hours after the bedtime dose to cover a full night of sleep. This study characterized SXB treatment patterns and discontinuation in narcolepsy patients.

Methods: Mayo Clinic patients from 1975–2020 were identified using an electronic health record-based search. Patients with ≥ 1 narcolepsy-specific ICD-9/10 code and ≥ 1 diagnostic mention of narcolepsy in clinical notes (identified using a natural-language-processing [NLP] algorithm) were included. NLP was used to identify SXB non-use events with manual chart reviews performed to characterize reasons for discontinuation, switching, or missing the second dose and effects of missing the second dose.

Results: Of the patients with narcolepsy prescribed SXB (n=351; mean age at first diagnosis code observed at Mayo Clinic, 32 y [IQR: 23.2–46.1]; 65.5% female; 92.3% white), 113 (32.2%) had clinical notes indicating discontinuation of SXB, with 71 (20.2%) including reasons for discontinuation. The most common reasons for discontinuation (n≥5) included lack of efficacy (n=11), side effects (n=10), gastrointestinal side effects (n=10), neurological side effects (n=9), psychiatric side effects (n=8), lack of access (insurance/cost, n=10), and resolution/absence of cataplexy (n=5). Mentions of switching from SXB to other drugs (n=12 patients) included switching to stimulants (mixed amphetamine salts, n=3; dextroamphetamine, n=2; methylphenidate, n=1), sedative hypnotics (zolpidem, n=2), antidepressants (mirtazapine, n=1), and wake-promoting agents (solriamfetol, n=1). Of the 38 patients (10.8%) with mentions of missing the second nightly SXB dose, reasons were recorded for 24 (63.2%), including inability to wake up (n=14), forgetting the second dose (n=3), and having to wake up early the following day (n=3). Consequences of missing the second dose were recorded for a small subset (increased cataplexy, n=4; lower daytime alertness, n=3; awakens earlier, n=1; tiredness, n=1).

Conclusion: Limited data are available regarding real-world use of SXB. This novel study used a combination of NLP algorithm and manual chart review to identify difficulties patients have with the second, middle-of-the night immediate-release oxybate dose and patient-experienced consequences of not adhering to the prescribed dosing regimen.

Support (if any): Avadel Pharmaceuticals

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0585

A FOUR-WEEK RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED, PHASE 2 STUDY OF MAZINDOL ER IN THE TREATMENT OF NARCOLEPSY

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Introduction: Mazindol is the first partial orexin 2 receptor agonist and triple monoamine reuptake inhibitor in development for the treatment of narcolepsy. A novel extended release (ER) formulation was developed to allow once-daily dosing and may provide a differentiated treatment option. (ClinicalTrials.gov Identifier: NCT04923594).

Methods: Study NLS-1021 was a Phase 2, four-week, double-blind, randomized, placebo-controlled study of mazindol ER (NLS-2) for the treatment of excessive daytime sleepiness (EDS) or cataplexy in adults with narcolepsy type 1 (NT1) or type 2 (NT2). Efficacy, safety, tolerability, and pharmacokinetics were assessed. Adult subjects diagnosed with NT1 or NT2 and washed out of narcolepsy medications at baseline were randomized 1:1 to receive placebo or 2 mg mazindol ER once-daily for one week followed by 3 mg once-daily for three weeks. The primary efficacy endpoint was the change from baseline at Week 4 in excessive

daytime sleepiness using the Epworth Sleepiness Scale (ESS). Secondary efficacy endpoints included improvement in weekly cataplexy attacks and overall disease severity as rated by the investigators (Clinician Global Impression of Severity; CGI-S) and patients (Patient Global Impression of Severity; PGI-S).

Results: Sixty-seven subjects were randomized (n = 33 NLS-2; 34 placebo). The baseline mean [SD] ESS score was 17.9 [2.97] in subjects receiving NLS-2 and 18.0 [3.05] in placebo. NLS-2 met the pre-specified primary endpoint, demonstrating a statistically significant improvement in EDS with a least-squares mean [SE] difference (NLS-2-placebo) of −3.6 [1.33] in the ESS total score at Week 4 (p = 0.0081). Observed mean change from baseline in ESS total score was −7.1 [5.6] for NLS-2 and −3.2 [5.3] for placebo. In NT1 subjects, baseline weekly number of cataplexy episodes was 14.1 [10.8] in subjects receiving NLS-2 (n=11) and 15.0 [10.2] in placebo (n=12). At Week 4, the weekly number of cataplexy episodes was reduced to 4.1 with NLS-2 and to 8.5 with placebo. NLS-2 was generally safe and well-tolerated with no severe or serious adverse events or discontinuations due to adverse events.

Conclusion: In subjects with narcolepsy, NLS-2 significantly improved EDS and the number of cataplexy attacks compared with placebo.

Support (if any): NLS Pharmaceuticals

Abstract citation ID: zsad077.0586

0586

AN OBSERVATIONAL RETROSPECTIVE STUDY OF THE PREVALENCE OF COMORBID POSTURAL ORTHOSTATIC TACHYCARDIA SYNDROME (POTS) IN NARCOLEPSY

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Introduction: Postural orthostatic tachycardia syndrome (POTS) is a clinical syndrome of dysautonomia associated with an excessive increase in heart rate following a shift to standing posture. As of 2019, POTS has a prevalence of 1-3 million (0.3-0.9%) in the United States. Narcolepsy is a chronic neurologic condition of persistent hypersomnolence irrespective of total sleep time that also is associated with REM-sleep dissociative features (i.e., cataplexy, sleep paralysis, sleep-related hallucinations). In recent years, viral infections have been established as a trigger for both neurologic conditions.

Methods: A manual chart review was performed for records from 11/1/2020 to 12/20/2022. The overall clinic population of narcolepsy was identified by searching the electronic medical record for the ICD-10 codes G47.411 (narcolepsy type 1 [NT1]), and G47.419 (narcolepsy type 2 [NT2]). The past medical history of these charts then was searched for a history of POTS to identify patients with both conditions. A separate chart review was performed to identify all patients with POTS in the clinic.

Results: Of the 1,433 total patients in the clinic population, 207 narcolepsy patients (NT1=73, 35.3%; NT2=134, 64.7%) and 24 POTS patients were identified. The co-morbid prevalence of narcolepsy with POTS was 8.7% (18, 95% CI 5.2-13.4%); of those patients with POTS, 75% had narcolepsy (95% CI 53.3-90.2%). Co-morbid prevalence was higher in NT1 (13, 17.8% with 95% CI 9.8-28.5%) than NT2 (5, 3.7% with 95% CI 1.2-8.5%). The overall co-morbid prevalence and the NT1 co-morbid prevalence was significantly higher than the overall clinic POTS population (1.26% with 95% CI 0.75-1.98%) and the general population.

Conclusion: The prevalence of POTS is significantly higher in narcolepsy patients than the overall general population, especially in the NT1 subgroup. Clinicians should consider screening POTS patients for narcolepsy, and vice versa. Further studies are warranted to explore the etiology of co-morbid narcolepsy and POTS.

Support (if any): N/A

Abstract citation ID: zsad077.0587

0587

DEMOGRAPHIC CHARACTERISTICS AND COMORBIDITIES OF PATIENTS WITH NARCOLEPSY: A PROPENSITY SCORE-MATCHED COHORT STUDY

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Introduction: Narcolepsy is a rare, chronic sleep disorder whose symptoms detrimentally impact quality of life. Narcolepsy has a complex phenotype associated with multiple comorbid conditions. This is the first study to use aggregate electronic health record (EHR) data to characterize the demographics and comorbidities of patients with narcolepsy.

Methods: An EHR-based search identified first-time Mayo Clinic patients between 2000–2020. Included patients had ≥1 narcolepsy-specific ICD-9/10 code and ≥1 disease-supportive statement in the clinical notes (identified using a natural language processing algorithm). A control cohort was propensity-matched for birth year, age at first institutional encounter, sex, race, ethnicity, number of diagnosis codes, and mortality. Common comorbidities were compared and ranked between cohorts by odds ratio (OR); P values were adjusted and calculated based on Bonferroni correction.

Results: In the EHR database (N=6,389,186 patients), 2057 patients with narcolepsy were identified (median age at first presentation to Mayo clinic, 32 y [range, 17–48]; 59.6% female; 92.6% white; 89.2% non-Hispanic) and propensity-matched with a control cohort of 2057 patients (median age at first presentation to Mayo clinic, 35 y [range, 12–52]; 58.9% female; 94.6% white; 84.5% non-Hispanic). Among the top comorbidities that occurred more frequently in the narcolepsy cohort compared to the control cohort (OR [95% CI]; P< 0.001) were sleep disorders (restless leg syndrome, 3.94 [3.09–5.02]; obstructive sleep apnea, 3.27 [2.83–3.79]; insomnia, 1.84 [1.57–2.17]); mood disorders (depression, 2.11 [1.86–2.40]; dysthymia, 1.86 [1.54–2.25]; anxiety, 1.67 [1.46–1.89]); and pain disorders (chronic pain syndrome, 2.20 [1.76–2.76]; migraine, 1.96 [1.66–2.31]; fibromyalgia, 1.90 [1.61–2.25]; carpal tunnel syndrome, 1.80 [1.46–2.22]; myalgia, 1.69 [1.45–1.97]). Other comorbidities statistically significantly associated with narcolepsy were (OR range, 1.33–1.95) irritable bowel syndrome (P< 0.001), asthma (P< 0.001), cervical spondylosis (P< 0.01), syncope (P< 0.01), and hypothyroidism (P< 0.05).

Conclusion: This propensity-matched cohort study affirmed prior studies of increased psychiatric and sleep disorders in patients with narcolepsy. Narcolepsy patients were twice as likely to experience chronic pain syndrome compared to the matched

control group. Understanding common narcolepsy comorbidities may help optimize treatment efficacy and increase understanding of the medical/psychiatric challenges of narcolepsy patients.

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0588

DNS AND SLEEP-DEPENDENT MEMORY CONSOLIDATION IN PEDIATRIC NARCOLEPSY TYPE 1

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Introduction: Disrupted nighttime sleep (DNS) is common in narcolepsy type 1 (NT1), yet its impact on cognitive function is unknown. Given known associations between sleep-dependent memory consolidation and N2 sleep spindles, we hypothesized that NT1 impairs memory consolidation, due to fragmented N2 sleep and altered N2 sleep spindles in the NT1 group.

Methods: In this case-control study, we trained n=23 NT1 participants [mean age 15.8 years (3.2)] and n=28 healthy control (HC) patients [13.6 years (3.7)] to criterion on a spatial declarative memory task before a nocturnal in-lab polysomnogram and then gave them a cued recall test upon awakening in the morning. NT1 participants could take SSRI/SNRI medication for cataplexy but were weaned off wake-promoting medications and excluded if on an oxybate. We extracted wake and sleep stage bout numbers from sleep and N2 spindle characteristics from the polysomnogram and conducted linear regression with memory consolidation results across groups.

Results: Adjusting for age, NT1 participants had longer sleep duration than HC, more N1%, lower N3%, higher Wake/N1 Index, as well as more bouts per hour of Wake, N1, N2, REM than controls (p's < 0.04). Compared to HC, NT1 subjects had similar N2 spindle density, amplitude, and sigma power, but shorter duration of N2 spindles (p=0.009). More NT1 participants could not meet performance criterion on the initial learning task and required an easier memory task vs. HC (p=0.02) despite being older than HC. NT1 participants showed a trend for impaired memory consolidation vs. HC across a night of sleep after adjusting for age, gender, and total sleep time (p=0.07). Across groups, shorter N2 spindle duration (p=0.02) but not increased N2 bout number was associated with worse sleep-dependent memory consolidation.

Conclusion: Compared to controls, NT1 participants showed encoding difficulties but only a trend difference in memory consolidation despite greater sleep fragmentation. NT1 participants had briefer N2 sleep spindles and overall, these shorter N2 spindles were associated with greater memory consolidation deficits. Future sleep therapeutic studies are needed to determine if sleep-dependent memory consolidation can be improved to address daytime cognitive problems in NT1 patients.

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0589**DOSE TITRATION OF ONCE-NIGHTLY SODIUM OXYBATE: ANALYSIS OF INTERIM DATA FROM RESTORE**Asim Roy¹, Brian Abaluck², Thomas Stern³, Clete Kushida⁴, Jordan Dubow⁵, Jennifer Gudeman⁵¹ Ohio Sleep Medicine and Neuroscience Institute, ² Private practice, ³ Advanced Respiratory and Sleep Medicine, PLLC, ⁴ Stanford University School of Medicine, ⁵ Avadel Pharmaceuticals

Introduction: FT218 (LUMRYZ™) is an investigational once-nightly sodium oxybate (ON-SXB) for treatment of adults with narcolepsy type 1 (NT1) or type 2 (NT2). The efficacy and safety of ON-SXB at doses 6, 7.5, and 9 g in patients with NT1/NT2 were confirmed in the phase 3 REST-ON clinical trial (NCT02720744). RESTORE is an ongoing, open-label extension/switch study to assess long-term safety and tolerability of ON-SXB (NCT04451668).

Methods: Individuals aged ≥16 years with NT1/NT2 are enrolled in Group A (participants who completed the REST-ON trial with no current oxybate use), Group B (participants who switched from twice-nightly immediate-release oxybates), or Group C (participants who are oxybate-naïve). Initial ON-SXB dose is 4.5 g/night for Groups A/C and is the nearest equivalent or closest single dose to their previous nightly dose for Group B. Investigators may alter the nightly dose by 1.5 g/week (maximum, 9 g/night) based on effectiveness and tolerability.

Results: A total of 184 participants were enrolled (180, ≥1-dose) as of July 1, 2022. Most participants are white (n=150 [83.3%]) and female (n=122 [67.8%]), and mean age is 35 years. Most participants in Groups A/C (n=43/50 [86.0%]) increased from the 4.5-g initial dose and had 2–4 dose adjustments during initial titration (median [range], 3 [0–5]); 47% (17/36) are stable at 7.5 g. The most common initial doses in Group B were 7.5 g (50/130 [38.5%]) and 9 g (47/130 [36.2%]). Most in Group B reaching a stable dose maintained their initial dose (70/118 [59.3%]); 43 increased (36.4%) and 5 decreased (4.2%) their initial ON-SXB dose. In Group B, 49.1% (53/108) had no dose adjustments (median [range], 1 [0–5]) and 83.0% (n=39/47) who started at 9 g maintained this dose. Most common treatment-related adverse events (>3%; safety population [n=180]) are nausea (11.7%), somnolence (6.7%), headache (5.0%), enuresis (5.0), dizziness (3.9%), tremor (3.9%), somnambulism (3.9%), and vomiting (3.3%).

Conclusion: Most study participants had successful titration of ON-SXB to a therapeutic and tolerable dose within 1 month. If granted final approval by the US Food and Drug Administration, ON-SXB will offer a once-nightly treatment for adults with narcolepsy.

Support (if any): Avadel Pharmaceuticals

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0590**EFFECT OF A WHOLE-FOOD PLANT-BASED DIET ON DAYTIME SLEEPINESS IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA**Joseph Cheung¹, Kripa Patel¹, Melanie Lawson¹¹ Mayo Clinic

Introduction: Consumption of diet rich in high saturated fats has been associated with a higher degree of daytime sleepiness. A whole-food, plant-based (WFPB) dietary pattern, which is low in saturated fat, has been shown to be beneficial in weight loss and other health

conditions. Patients with obstructive sleep apnea (OSA) frequently experience excessive daytime sleepiness despite treatment. This study aims to assess the effect of a short term (21 days) WFPB diet on daytime sleepiness in patients with obstructive sleep apnea.

Methods: Patients were recruited from the Mayo Clinic Jacksonville sleep clinic who have a diagnosis of OSA who are on PAP therapy but have daytime sleepiness with Epworth Sleepiness Scale (ESS) score of 5 or above. Participants were asked to follow a strict WFPB diet for 21 days using the Fork Over Knives hand-book as a guide. They were also asked to complete ESS before switching to and after completing a WFPB diet for 21 days.

Results: A total of 10 participants completed the 21-day WFPB diet. Eight out of ten participants had reported a reduction in daytime sleepiness. Overall, we found a mean decrease in ESS score of 3.8 in all participants, with 3 patients had a significant decrease in ESS score of ≥ 7. All participants completed the study with ≥ 90% adherence to a WFPB diet. In addition, participants also reported a mean weight loss of 4.2 kg. Two participants noted headaches during this 21-day period.

Conclusion: Significant improvement with daytime sleepiness was found in patients who switched to a WFPB diet for 21 days. No significant correlation between improvement in ESS and weight loss was found.

Support (if any):

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0591**EFFECTIVENESS AND OPTIMIZATION OF LOWER-SODIUM OXYBATE IN PARTICIPANTS WITH NARCOLEPSY SWITCHING FROM SODIUM OXYBATE (SEGUE)**Eileen Leary¹, Craig Pfister¹, Douglas Fuller¹, Wayne Macfadden¹¹ Jazz Pharmaceuticals

Introduction: Lower-sodium oxybate (LXB, Xywav®) contains 92% less sodium than higher-sodium oxybate (SXB, Xyrem®) and is approved for treating cataplexy or excessive daytime sleepiness in patients with narcolepsy (≥7 years of age) and idiopathic hypersomnia in adults. The SEGUE study examines the safety, tolerability, effectiveness, and treatment optimization in participants with narcolepsy transitioning from SXB to LXB.

Methods: Eligible participants in this multicenter, open-label study were adults with narcolepsy type 1 or 2 who were on a stable dose (maximum 9 g/night; no single dose >6 g) and regimen (once, twice, or thrice nightly) of SXB. After 2 weeks on a stable SXB dose/regimen (baseline period), participants switched to the same dose/regimen of LXB (intervention period; 6 weeks). If needed, LXB dose/regimen was titrated to optimize efficacy/tolerability. Assessments included the Patient Global Impression of Change (PGIC), a forced preference questionnaire (FPQ), an ease of switching medication scale (EOSMS), and the Epworth Sleepiness Scale (ESS); all collected at end of treatment or early discontinuation.

Results: Of 60 participants who entered the intervention period, a majority were female (62%) and White (88%); mean (SD) age was 43.9 (15.33) years. Starting and ending (end of treatment or early discontinuation) median total nightly doses of LXB were 8.5 g and 9.0 g, respectively. In terms of regimen, most took LXB twice nightly (93% at both time points). Fifty-six participants completed the transition period; mean (SD) time to stable dose was 2.5 (4.82) days, and median (range) number of changes in dose/regimen was 0.0 (0, 1). At end of treatment or early discontinuation, most participants reported improvement (very much/much/minimal; 45%) or no change (48%) in narcolepsy

symptoms on the PGIC, preferred LXB over SXB on the FPQ (79%), and reported the transition to LXB was easy, extremely easy, or not difficult at all on the EOSMS (93%). Mean (SD) change from baseline on the ESS (n=55) was -0.7 (2.31).

Conclusion: Most participants with narcolepsy switched from SXB to LXB with minimal modifications of dose/regimen and reported the transition process was easy. Effectiveness of oxybate treatment (ESS) was maintained after transition, and most preferred LXB over SXB.

Support (if any): Jazz Pharmaceuticals.

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0592

EFFICACY OF LOWER-SODIUM OXYBATE BY BASELINE SLEEP INERTIA IN A PHASE 3 CLINICAL STUDY IN PATIENTS WITH IDIOPATHIC HYPERSOMNIA

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Introduction: Idiopathic hypersomnia is a debilitating neurologic sleep disorder. Sleep inertia (difficulty awakening) is a common symptom that can significantly impair functioning and quality of life. This post hoc analysis evaluated response to lower-sodium oxybate (LXB; Xywav®) by baseline sleep inertia in a phase 3 trial (NCT03533114).

Methods: Eligible participants began LXB treatment with an open-label treatment titration and optimization period (10–14 weeks), followed by a 2-week stable-dose period (SDP). Participants were randomized to placebo or continued LXB treatment during a 2-week, double-blind, randomized withdrawal period (DBRWP). Using the visual analog scale for sleep inertia (VAS-SI), participants rated their difficulty awakening during baseline, SDP, and DBRWP on a 100-mm line with anchors at 0 (very easy) and 100 (very difficult). VAS-SI terciles comprised score segments of < 44 (group A), ≥44 to < 70 (group B), and ≥70 (group C). Efficacy assessments included the Epworth Sleepiness Scale (ESS), Idiopathic Hypersomnia Severity Scale (IHSS), Clinical Global Impression of Severity (CGIs), and Patient Global Impression of Change (PGIC).

Results: Participants (A, n=34; B, n=33; C, n=32) were a mean (SD) 40.7 (13.5) years of age and primarily female (74%). At baseline, participants with the highest VAS-SI scores had numerically higher mean (SD) ESS (A=16.0 [3.1], B=15.6 [2.6], C=17.1 [2.4]) and IHSS (A=26.7 [7.7], B=34.5 [5.9], C=36.3 [5.5]) scores. Participants with the highest baseline sleep inertia were more frequently rated severely ill on the CGIs (A=17.6%, B=12.1%, C=34.4%). Baseline total sleep time trended higher with increasing VAS-SI scores. From baseline to end of SDP, mean (SD) scores decreased (improved) on the ESS (A=-9.9 [5.1], B=-9.8 [3.5], C=-10.0 [5.1]) and IHSS (A=-14.1 [9.9], B=-19.0 [9.0], C=-18.1 [9.9]), regardless of baseline sleep inertia; nearly all (99%) participants reported improvement on the PGIC. Mean (SD) VAS-SI scores decreased by 9.3 (11.9), 31.5 (14.8), and 42.8 (22.9) in groups A, B, and C, respectively, at end of SDP. Spearman correlation coefficients for VAS-SI and IHSS items assessing sleep inertia were moderate (≥0.3) to strong (≥0.6).

Conclusion: Participants with higher baseline sleep inertia generally had greater baseline disease burden. LXB treatment

was efficacious across subgroups regardless of baseline sleep inertia.

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0593

FUNCTIONAL OUTCOMES OF SLEEP QUESTIONNAIRE IN A PHASE 2 STUDY OF MAZINDOL ER IN NARCOLEPSY

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Introduction: Efficacy secondary outcome measure Functional Outcomes of Sleep Questionnaire, Short Version (FOSQ-10) was collected in the Phase 2 (POLARIS, NLS-1021), multicenter (n=21) study of mazindol ER in adult participants with narcolepsy type 1 (NT1) or type 2 (NT2) (ClinicalTrials.gov Identifier: NCT04923594).

Methods: Adults diagnosed with NT1 or NT2 who were washed out of narcolepsy medications at baseline were included into the study. Patients were treated with mazindol ER (NLS-2) at once-daily 2 mg for one week and once-daily 3 mg thereafter or matching placebo (PBO) on a 1:1 ratio. Throughout the study, FOSQ-10 was assessed and compared vs. PBO scores at baseline. Treatment emergent adverse events (TEAEs) were assessed.

Results: Sixty-seven participants were randomized (NT1 33.3% in NLS-2 group versus 35.3% in PBO). At baseline, the mean [SD] FOSQ-10 score was 23.1 (5.5) for the NLS-2 arm and 23.7 (7.1) for the PBO arm. After four weeks of treatment, there was an increase of 4.1 (9.0) on NLS-2 vs an increase of 0.4 (6.9) on PBO (p = 0.04). Similar magnitude of effect was seen in NT1 patients (D = +4.7, p = 0.08, n = 20) as well as NT2 patients (D = +3.0, p = 0.20, n = 44) No serious adverse events were reported. The most frequently reported TEAEs (>5%) were dry mouth, nausea, decreased appetite and tachycardia.

Conclusion: Mazindol ER resulted in significant improvements of functional outcome measure FOSQ-10. These secondary outcome results support the efficacy of mazindol ER on cataplexy attacks, in NT1 patients, and on sleepiness, in NT1 as well as in NT2 patients.

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0594

HYBRID DECENTRALIZED RECRUITMENT APPROACH TO A RARE DISEASE REGISTRY FOR PEDIATRIC PATIENTS WITH NARCOLEPSY: THE CATNAP® REGISTRY

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Introduction: Limited information is available on the natural history, presentation, and management of pediatric

narcolepsy. CATNAP® is a retrospective and prospective, longitudinal, multicenter, web-based pediatric narcolepsy registry (NCT04899947). The primary objectives are to improve understanding of the natural history of pediatric narcolepsy, characterize symptom presentation and diagnosis, and understand treatment practices and outcomes. After registry initiation, an innovative decentralized approach was added to adapt to the post-COVID-19 environment and reach additional participants via social media.

Methods: Eligible children/adolescents (< 18 years) with confirmed narcolepsy were recruited. Participants, caregivers, and clinicians, leveraging web-based portals, answered questions on sociodemographic characteristics; diagnostic, medical, and treatment history; comorbidities; and disease progression. Participants continue to answer follow-up questions annually until they reach 25 years of age or decline to participate. Since registry initiation in September 2020, 17 sites have been activated, including a virtual site launched in August 2022. Hybrid decentralized recruitment required a new web interface, Institutional Review Board submissions, and 7-week social media campaign (press release, 5 targeted posts) to accompany the virtual site launch.

Results: A total of 126 participants have been enrolled (signed consent), including 75 participants at 16 physical sites over the first 2 years and 51 participants at the virtual site over 10.6 weeks. Rates of engagement (eg, clicks, likes, and shares) for Instagram (3.2%), LinkedIn (7.2%), and Twitter (2.4%) exceeded “good engagement rate” benchmarks for these platforms. Although the engagement rate for Facebook was below benchmarks (< 2%), the absolute number of “clicks” (29) was the largest among social media platforms in the campaign.

Conclusion: A hybrid recruitment approach for CATNAP demonstrates incorporation of patient-driven considerations into clinical trial design and increases access to future real-world data registries and studies. Decentralization likely increases enrollment and may enable representation from more diverse regions and populations. This is especially important for rare diseases. The CATNAP Registry provides valuable information on the experience and management of pediatric narcolepsy, which will benefit patients and caregivers, inform clinical decision-making, and potentially contribute to development of new treatments. This successful implementation of a hybrid approach with physical and virtual sites could inform design of future registries.

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0595

LONG-TERM EFFICACY ON CATAPLEXY ATTACKS AND EXCESSIVE DAYTIME SLEEPINESS IN OPEN-LABEL EXTENSION STUDY (NLS-1022) OF MAZINDOL ER

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Introduction: Mazindol ER (extended-release), the first partial orexin-2 receptor agonist and triple mono-aminergic reuptake

inhibitor, has demonstrated efficacy and safety in significantly reducing excessive daytime sleepiness (EDS) and cataplexy attacks in narcolepsy type 1 (NT1) and type 2 (NT2) patients (POLARIS, Study NLS-1021). This efficacy was further studied in an open-labeled extension (OLE) study (ClinicalTrials.gov Identifier: NCT04923594).

Methods: A multicenter, 6-month, OLE study with 51 narcolepsy patients previously enrolled in a double-blind mazindol ER study. Patients were administered 3mg mazindol ER once daily in the morning. Narcolepsy symptoms and adverse events were recorded. Safety measures included monthly physical and laboratory examinations. The primary efficacy measure was the change from baseline in EDS using the Epworth Sleepiness Scale (ESS). Secondary measures included weekly cataplexy attacks, the overall disease severity as rated by the investigators (Clinician Global Impression of Severity) and patients (Patient Global Impression of Severity).

Results: Mazindol ER at 3 mg once-daily doses, produced overall improvements in EDS and narcolepsy within 1-2 weeks of starting dosing. Reported improvements included diminished daytime sleepiness ($p < 0.001$); significant decreases in cataplexy attacks ($p < 0.001$); and multiple improvements in symptoms severity and function. Adverse events were generally mild and patients showed no evidence of tolerance.

Conclusion: Mazindol ER is a convenient, safe, well-tolerated and effective treatment for narcolepsy. Its anticataleptic and wake-promoting effects indicate that it may be a new therapeutic option for patients with NT1 or NT2 similar or better than various combinations treatments currently available.

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0596

OVERLAP OF PSYCHIATRIC DISORDERS WITH CENTRAL HYPERSOMNIA

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Introduction: In sleep clinics, hypersomnia is a frequently encountered condition. While narcolepsy and idiopathic hypersomnia are discrete diagnoses that typically do not have co-existing psychiatric co-morbidities, sleep practitioners often have to address mental illness and/or psychotropic medication needs in these patients with hypersomnia. The reasons for co-occurrence of idiopathic hypersomnia and narcolepsy with psychiatric disorders is not well understood. This study aimed to assess the degree of overlap between psychiatric diagnoses with central hypersomnias and the temporal relationship between the development of hypersomnia and psychiatric conditions.

Methods: Using the University of Utah EPIC database, patients with diagnoses of idiopathic hypersomnia or narcolepsy encountered over the last decade were identified. Out of the 307 available medical records, only those that met strict criteria for diagnosis of narcolepsy and idiopathic hypersomnia were included. Medical records were reviewed for the presence of psychiatric disorders and psychotropic medication use, and to assess the prevalence of mental illness with central hypersomnia.

Results: Out of 119 patients that met ICSD-2 criteria for central hypersomnia, 37 were diagnosed with narcolepsy type 1 (T1N), 59 with narcolepsy type 2 (T2N) and 23 with idiopathic hypersomnia (IH). There were 69/119 (58%) patients with central

hypersomnia that had psychiatric comorbidities with 23/37 (62%) of T1N, 32/59 (54%) of T2N and 14/23 (60%) of IH experiencing psychiatric problems. Approximately 45% were prescribed antidepressants or a mood stabilizer either before, during or after diagnosis of a central hypersomnia. 46% of patients on stimulants alone vs. 23% of patients on sodium oxybate had a concurrent psychiatric diagnoses or psychotropic medication use.

Conclusion: Given the degree of overlap between psychiatric disorders and central hypersomnias, further research is necessary to understand whether this overlap is a result of common neurological substrates driving these disorders or whether the hypersomnia is from comorbid psychiatric disorder or psychotropic medication use. The highest prevalence of psychiatric illness was seen with T1N. Patients with hypersomnia on sodium oxybate had lower rates of psychiatric co-morbidities. Whether these findings point to more optimal diagnosis and treatment of underlying hypersomnia with reduced need for psychotropic medication needs to be understood.

Support (if any): None

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0597

PATH TO DIAGNOSIS AND IMPACT OF NARCOLEPSY ON QUALITY OF LIFE: A SURVEY OF PEOPLE LIVING WITH NARCOLEPSY

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Introduction: Research was undertaken to better understand the path to a narcolepsy diagnosis, common symptoms, and the impact of narcolepsy on work, social interactions, and mental health.

Methods: In February 2022, an email invitation to an online, 27-question survey was sent to US members of MyNarcolepsyTeam, a social network of >9,800 members.

Results: In total, 110 members completed the survey. 38% of respondents started to experience symptoms before reaching 16 years of age. Most commonly experienced symptoms included excessive daytime sleepiness (EDS; 93%) and fatigue (84%). In total, 72% were also experiencing some form of sleep disturbance and 67% were already suffering from cognitive/memory challenges. 68% who were eventually diagnosed with narcolepsy type 1 (NT1) had cataplexy attacks. For 31%, getting to a narcolepsy diagnosis took ≥10 years. In fact, 64% were initially under- or misdiagnosed with something other than narcolepsy, including depression (73%), sleep apnea (36%), or attention-deficit/hyperactivity disorder (16%). 74% of patients with NT1 have continued to experience cataplexy, with 46% having some form of a cataplexy episode a few times per week. Cataplexy episodes were triggered by a wide range of emotional situations, including over-tiredness (70%), anger (48%), being startled (46%), laughter (46%), fear (44%), excitement (38%), or crying (33%). 76% of respondents indicated that the impact of narcolepsy on daily life is extremely or very severe. The far-reaching impact on quality of life was evident in that most respondents reported that narcolepsy interfered with work (82%), social life (86%), everyday chores (85%), and exercise (85%) and has limited career options (76%). The emotional toll of

narcolepsy manifested in feeling isolated (83%), depressed (81%), anxious (80%), or embarrassed (75%).

Conclusion: Patients routinely experienced a misdiagnosis or a “missed” diagnosis based on common symptoms experienced. Being able to quickly identify narcolepsy as the root cause for symptoms of EDS, fatigue, and sleep disturbances can lead to getting the patient on the best treatment path as early as possible. Understanding the physical, emotional, and quality-of-life impact of narcolepsy can help clinicians provide a more holistic approach to treating their patients.

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0598

PATIENT-REPORTED SLEEP QUALITY IN PEOPLE WITH NARCOLEPSY TRANSITIONING FROM SODIUM OXYBATE TO LOWER-SODIUM OXYBATE

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Introduction: Lower-sodium oxybate (LXB; Xywav®), which contains the same active moiety as higher-sodium oxybate (SXB; Xyrem®) but with 92% less sodium, is approved by the US Food and Drug Administration (FDA) for treating cataplexy or excessive daytime sleepiness in patients ≥7 years of age with narcolepsy. LXB is recognized as clinically superior to SXB in narcolepsy by the US FDA due to lower chronic sodium exposure. Real-world data related to sleep quality following transition from SXB to LXB are lacking.

Methods: Transition Experience of persons with Narcolepsy taking Oxybate in the Real-world (TENOR; NCT04803786) was a patient-centric, prospective, observational, noninterventional, virtual-format study of US adults with narcolepsy (type 1 or 2) transitioning from SXB to LXB within the previous/upcoming 7 days. Longitudinal data collected during transition and for 21 weeks thereafter were based on daily and weekly questionnaires and sleep diaries instructing participants to rate the quality of their sleep and how refreshed they felt upon waking, and to record their sleep latency, wake after sleep onset (WASO), time in bed (TIB), and total sleep time (TST).

Results: The mean (standard deviation [SD]) age of the 85 participants (narcolepsy type 1, n=45; narcolepsy type 2, n=40) was 40.3 (13.0) years; most were female (73%) and White (87%). Almost all participants took SXB (82/85, 96%) twice nightly prior to transition and LXB (82/84, 98%) twice nightly after transition. Most participants rated their sleep quality as “good” or “very good” at baseline (45/84, 54%) and end of study (38/71, 54%), while 24/84 (29%) and 30/71 (42%) reported feeling “well-rested” or “very well-rested” at baseline and end of study, respectively. At end of study, changes (n=71) in mean (SD) sleep latency, WASO, TIB, and TST were −10.5 (16.2), −14.8 (56.6), 7.6 (67.7), and 33.0 (93.8) minutes, respectively.

Conclusion: Although participant-reported sleep quality was generally unchanged during the study, a greater percentage of participants reported feeling refreshed at end of study (on LXB) than at baseline (on SXB); however, there was no non-transitioning arm for comparison. Small changes were noted at end of study in sleep parameters, including sleep latency, WASO, and TST.

Support (if any): Jazz Pharmaceuticals

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0599**SLEEP STAGE TRANSITION PATTERNS AMONG YOUTH WITH CNS DISORDERS OF HYPERSOMNOLENCE**Fabio Pizze¹, Kiran Maski², Guangyu Zhu², Bo Zhang², Thomas Scammell³, Giuseppe Plazzi⁴, Cecilia Diniz Behn⁵¹ Alma Mater Studiorum - Università di Bologna, ² Boston Children's Hospital, ³ Beth Israel Deaconess Medical Center,⁴ University of Bologna, ⁵ Colorado School of Mines

Introduction: Narcolepsy type 1 (NT1) is associated with frequent sleep stage transitions during nocturnal sleep. In this study, we report the pattern of sleep stage transitions that occurs and its relationship to CSF-orexin levels among pediatric NT1 patients. Furthermore, we study the patterns of sleep stage transitions in patients with Narcolepsy Type 2 (NT2) and Idiopathic Hypersomnia (IH).

Methods: We conducted a retrospective, cross-sectional study of nocturnal polysomnograms (PSGs) of a cohort of patients ages 5-21 years with NT1 (n=160), NT2 (n=24), IH (n=28), and subjectively sleepy controls (n=115) collected at Boston Children's Hospital, Boston, MA and University of Bologna, Bologna, Italy. We compared the patterns of transitions between different sleep/wake stages during the nocturnal PSG by diagnostic group as well as by CSF-orexin level (low ≤ 110 pg/ml; normal >110 pg/ml) using chi-square testing that was adjusted for multiple comparisons.

Results: NT1 demonstrated a pattern of transitions from wake and all sleep stages except N3 sleep vs. controls, NT2, and IH with frequent transitions between wake and N1 sleep and less frequent transitions from N1 sleep to N2 sleep. The NT2 group had a distinct pattern of transitions from N1 vs. controls with more frequent transitions to REM sleep and less frequent transitions to N2. The IH group showed a similar pattern of sleep/wake transitions vs. controls. The pattern of transitions for the low CSF orexin group was different for all sleep stages and wake vs. normal level with frequent transitions from N2 sleep and REM sleep to wake and N1 sleep.

Conclusion: Young NT1 patients have a unique pattern of transitions between sleep/wake states. These findings are further confirmed by CSF orexin level. NT2 patients have a pattern of sleep stage transitions more similar to controls with the exception of the transitions from N1 sleep suggesting dysregulation of this light sleep stage. In contrast, the IH group shows patterns of transitions between sleep stages and wake that are similar to controls. Overall, results support differing sleep phenotypes demarcating these patients with severe daytime sleepiness.

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0600**SUBJECTIVE REPORTING OF DISRUPTED NIGHTTIME SLEEP AND ASSOCIATED FUNCTIONAL OUTCOMES IN NT1 YOUTH**Gillian Heckler¹, Jennifer Worhach¹, Thomas Scammell², Kiran Maski¹¹ Boston Children's Hospital, ² Beth Israel Deaconess Medical Center

Introduction: In people with NT1, Disrupted Nighttime sleep (DNS) can be measured using the Wake/N1 Index, the number

of transitions from sleep to wake or N1 sleep per hour of sleep. However, it remains unknown if this DNS measure correlates with sleep quality and daytime symptom burden. We compared the Wake/N1 Index with perceptions of sleep quality in young NT1 patients and healthy controls (HC) and determined its relationships with subjective sleep quality, daytime behavior, and cognition across groups.

Methods: 25 HC (mean age 13.4 years) and 23 NT1 participants (mean age 15.8 years) completed a 15-item survey after sleeping a minimum of 6 hours during an in-lab polysomnogram. The survey included questions from validated surveys on habitual sleep quality, fatigue, sleepiness and cognitive function. We dichotomized survey responses into frequent or infrequent concerns. We compared responses using Fisher Exact tests and logistic regression to determine associations with the Wake/N1 Index. NT1 participants could take SSRI/SNRI medication for cataplexy but were weaned off wake-promoting medications and excluded if on an oxybate.

Results: Compared to HC, NT1 participants reported more frequent restless sleep, nighttime moaning/groaning/talking, tossing and turning, and waking more than once during the night ($p's < 0.02$) and showed a trend for more leg kicking during sleep ($p=0.06$). NT1 and HC groups did not differ in falling asleep quickly and returning back to sleep quickly after waking. NT1 subjects reported more frequent fatigue, difficulty keeping thoughts focused, difficulty thinking clearly and making decisions, problems remembering things, and dozing/napping inadvertently. Across groups and controlling for age, the Wake/N1 Index was associated with subjective reporting of waking more than once (OR=3.2) as well as problems with daytime alertness (OR 1.5) and fatigue (OR 1.4).

Conclusion: Young NT1 patients describe DNS as a multi-factorial complaint comprising problems with sleep maintenance, restless sleep, parasomnia-like behaviors, and periodic limb movements. The Wake/N1 Index is associated with perceptions of waking at night as well as daytime alertness and fatigue across groups. This work suggests that Wake/N1 Index could be a useful measure of sleep instability and inform future research on DNS impact on daytime function.

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0601**AN ATYPICAL CAUSE OF HALLUCINATIONS IN TYPE 1 NARCOLEPSY**Jason Unger¹, Subodh Arora¹, Jennifer Creamer¹, Lacie Hediger²¹ Walter Reed National Military Medical Center (National Capital Consortium), ² Eisenhower Army Medical Center

Introduction: Narcolepsy is a disorder of hypersomnolence affecting between 1:5000-1:10,000 individuals. Type 1 Narcolepsy can be differentiated from Type 2 Narcolepsy by the presence of cataplexy. Visual hallucinations are reported in 50-80% of T1 Narcoleptics and ~25% of T2 Narcoleptics. This is thought to be a REM-related phenomenon occurring at transitions of sleep and wakefulness. Auditory hallucinations or paranoid delusions are more rare. We report a case of a 17 year old patient who experienced psychotic symptoms after trialing more than one class of stimulants.

Methods: This was primarily a retrospective case review. A subsequent literature search was performed reviewing similar reports of psychosis secondary to medications used to treat Narcolepsy.

Results: The patient is a 17 year old female who was 10 years old at the time of her diagnosis of Narcolepsy T1. At onset, the patient had reported cataplexy and visual hallucinations occurring at the time of sleep onset and waking. After finding minimal help with stimulants, by age 15 she was maintained on sodium oxybate 6 grams per night for her cataplexy and started modafinil 200mg BID for wakefulness. She then reported new auditory hallucinations and hyperreligiosity and was admitted to inpatient psychiatry where both medications were discontinued. She was subsequently started on extended release methylphenidate and within 2 months had a recurrence of auditory hallucinations and hyperreligiosity resulting in two consecutive inpatient hospitalizations for psychosis.

Conclusion: Psychosis induced by medications for Narcolepsy has been reported in the literature where sodium oxybate and stimulants are the most common offending agents. Symptoms primarily related to modafinil or armodafinil are less frequently described. Most medications used to treat Narcolepsy may directly or indirectly act on dopamine pathways, which in theory have the propensity to lead to psychotic symptoms. Small studies of patients with Narcolepsy have reported psychosis in less than 1-2% of Modafinil users. Larger meta-analyses of patients with both Narcolepsy and Schizophrenia, have not found an increased likelihood for uncontrolled psychotic symptoms while on modafinil. Further case studies are needed to elucidate the relationship between stimulants and risk of psychosis in Narcolepsy patients.

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0602

BURDEN OF NARCOLEPSY IN JAPAN: A NATIONWIDE REAL-WORLD DATABASE STUDY FROM THE PERSPECTIVES OF DIRECT MEDICAL COST AND COMORBIDITY

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Introduction: In Japan, narcolepsy is not currently covered by a medical expense assistance program (e.g., System of Medical Payment for Services and Support for Persons with Disabilities). The people living with narcolepsy in Japan have been speaking up against current situation. However, to the best of our knowledge, reports about economic burden (direct + indirect) and comorbidity are limited in Japan. The study objectives were to reveal the burden of narcolepsy from the perspectives of direct medical cost and comorbidity, and also to compare it to epilepsy as a benchmark, which is covered by the above program.

Methods: Patients diagnosed with narcolepsy (>1 ICD-10code [G47.4]) were identified from April 2017 to March 2022 using an employment-based health insurance claims data compiled by JMDC Inc. Patients with epilepsy (>2 ICD-10code [G40]) were 1:4 matched for age, sex, insurance status, and observation period. Direct medical cost (including inpatient, outpatient, and medication) and comorbidity were analyzed. The 95% confidence intervals (CI) for differences of two diseases were calculated by bootstrapping (direct medical cost) or conditional logistic regression model (comorbidity). The protocol was approved by the Ethics Review Committee of the Tohoku University Graduate School of Medicine.

Results: We identified 4,594 patients with narcolepsy (sex; 58.7% males, age; 35.2 ± 12.7 years) and 18,376 patients with epilepsy (sex; 58.7% males, age; 35.8 ± 12.2 years). Overall annual direct medical cost per person was 349,188 JPY (narcolepsy) and 521,495 JPY (epilepsy). The difference was -172,307 JPY (95%CI; -199,793JPY to -146,567 JPY). Sleep apnea syndrome (odds ratio; 7.37, 95% CI; 6.52 to 8.33), ADHD (3.21, 2.86 to 3.61), and obesity (1.51, 1.22 to 1.87) were more prevalent in narcolepsy than in epilepsy, while developmental disorders (0.34, 0.27 to 0.41), fracture (0.78, 0.68 to 0.90), and high blood pressure (0.78, 0.71 to 0.86) were less prevalent.

Conclusion: This study showed direct medical cost and comorbidity of narcolepsy in Japan, which helps future discussion on the medical expense assistance program for people living with narcolepsy. Further research is needed to show the indirect economic burden to clarify the burden of narcolepsy.

Support (if any): Eisai Co., Ltd.

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0603

CHARACTERIZATION OF PATIENTS WHO HAD $\geq 5\%$ WEIGHT LOSS WITH FT218 (ONCE-NIGHTLY SODIUM OXYBATE): POST HOC ANALYSIS FROM REST-ON

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Introduction: Narcolepsy, particularly type 1 (NT1), is often comorbid with obesity. FT218 (LUMRYZ™) is an investigational once-nightly sodium oxybate (ON-SXB) formulation whose efficacy and safety were shown in the phase 3 REST-ON clinical trial (NCT02720744).

Methods: REST-ON was a 13-week, randomized (1:1), double-blind, placebo-controlled multicenter study in patients ≥ 16 years old with NT1/NT2. Stable concomitant stimulant use was permitted. A post hoc analysis of participants in the ON-SXB group experiencing $\geq 5\%$ weight loss (weight-loss group) was conducted.

Results: In REST-ON (n=212), mean participant age was 31.2 years (range, 16–72), 67.9% were female, 75.5% were white, 76.4% had NT1, mean baseline BMI was 28.1 kg/m² (range, 16.9–71.9), and 61.3% were taking stimulants. At week 13, 17.8% (19/107) of participants receiving ON-SXB experienced $\geq 5\%$ weight loss vs 3.8% (4/105) of participants receiving placebo (P < 0.001). Compared to the REST-ON population, the weight-loss group had similar age and proportion of NT1 diagnosis, a smaller proportion was female, and a higher proportion was white and was taking stimulants. At baseline, mean BMI was 25.6 kg/m² (range, 20.3–34.0) in the weight-loss group, 47.4% (9/19) were overweight (BMI 25.0–29.9 kg/m²) or obese (BMI >30 kg/m²); none were underweight (BMI < 18.5 kg/m²). At week 13, 31.6% (6/19) remained overweight or obese; none were underweight. Excessive daytime sleepiness was significantly improved from baseline to week 13 (ON-SXB 9 g) in the weight-loss group vs the ON-SXB group without weight loss

(Maintenance of Wakefulness test, $P < 0.05$; Epworth Sleepiness Scale score, $P < 0.001$). Adverse events of nausea and vomiting were more frequent in the weight-loss group vs the ON-SXB group without weight loss; however, rate of discontinuations owing to AEs in the weight-loss group was approximately half that of the ON-SXB group without weight loss.

Conclusion: These data expand the body of knowledge regarding weight loss during treatment with sodium oxybate. Given the high proportion of comorbid obesity among people with narcolepsy, the additional benefit of potential weight loss with sodium oxybate may further inform treatment selection. Whereas ON-SXB was effective overall, further exploration of possible increased pharmacologic response in certain subgroups should be evaluated.

Support (if any): Avadel Pharmaceuticals

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0604

DIAGNOSTIC DELAY AND ITS CAUSES IN NARCOLEPSY TYPE 1 IN JAPAN : WITH SPECIAL EMPHASIS ON CATAPLEXY

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Introduction: Although narcolepsy type 1 is characterized by the pathognomonic symptom of cataplexy, it has been reported that there is long diagnostic delay in various countries. However, the causes of this delay have not been studied enough except for European countries. Japan is in a unique position in that all the people have public medical insurance coverage that allows them to have unlimited direct access to any medical specialists, therefore, once the patients experienced cataplexy, theoretically they could consult their symptom to sleep specialists with no financial burden. Under this condition, this study aims at characterizing the diagnostic delay and its causes in patients with narcolepsy type 1, and investigating whether cataplexy contributes to the accelerating the diagnostic process.

Methods: This retrospective study dealt with consecutive 45 patients (20 men/ 25 women) with narcolepsy type 1, whose diagnosis was made from April 2006 to September 2022 based on the PSG/MSLT criteria of the International Classification of Sleep Disorders, 3rd edition. We performed the chart review to retrieve demographic and clinical information, and the diagnostic process including the stage before coming to our sleep clinic.

Results: The diagnostic delay was 13.7 ± 11.9 years (range 0.5-47 years, median 9.0 years). Cataplexy was the first manifestation in 9 out of 45 (20.0%), and excessive daytime sleepiness (EDS) and cataplexy occurred almost at the same time in 11(24.4%) patients. 24 (53.3%) patients considered cataplexy disturbing and/or of pathological nature, but for the remaining 21 patients, cataplexy was a kind of habit until EDS became problematic for their daily life. Seven (15.6%) patients had been diagnosed as having epilepsy, and the first medical contact of 4 patients was emergency room visit due to cataplexy leading to the diagnoses of hyperventilation syndrome, transient ischemic attack, and consciousness loss attack of unknown origin.

Conclusion: There was substantial diagnostic delay in patients with narcolepsy type 1, and cataplexy did not seem to be properly evaluated in Japan.

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0605

EFFECT OF A MINDFULNESS-BASED INTERVENTION ON HYPERSOMNIA SYMPTOM SEVERITY IN PARTICIPANTS WITH NARCOLEPSY: A PRELIMINARY REPORT

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Introduction: Narcolepsy is a chronic sleep disorder that can greatly inhibit sleep quality, daytime functioning, and health-related quality of life. Although medication is the first-line treatment to manage narcolepsy symptoms, behavioral interventions may provide additional benefits. We examined the impact of varying lengths of a group mindfulness-based intervention on symptoms of hypersomnia among participants diagnosed with narcolepsy.

Methods: We randomized 60 participants to 3 versions of a mindfulness-based intervention: brief (4 weeks), standard (8 weeks), or extended (12 weeks). Groups of four participants met weekly or biweekly with a trained instructor via video-conference. Participants completed the Hypersomnia Severity Index (HSI) at baseline, 4 weeks, 8 weeks, and 12 weeks to assess hypersomnolence severity and related impairment. Paired samples t-tests were conducted to examine differences from baseline to post-treatment for the HSI total score, symptoms subfactor, and impairment subfactor. Linear mixed models (LMM) were conducted on the HSI total score to examine changes in the three groups across each assessment time point. Analyses were conducted using an intent-to-treat approach with the last observation carried forward for participants who had missing data after the baseline assessment (brief, $n = 1$; standard, $n = 5$; extended, $n = 3$).

Results: There were no significant group differences on the HSI total score or subfactor scores at baseline. Analyses revealed a significant decrease in HSI total scores from baseline to post-treatment ($d = .533$, $p < .001$), a significant decrease in hypersomnia symptoms ($d = .373$, $p < .01$) and a significant decrease in hypersomnia impairment ($d = .549$, $p < .001$). LMM revealed a main effect over time, indicating that hypersomnia severity improved from baseline to the study endpoint, across all treatment arms ($t = -3.58$, $p < .001$) but no significant time x treatment interaction effects emerged.

Conclusion: This preliminary report suggest that mindfulness programs can reduce hypersomnia symptoms for individuals with narcolepsy over a 12-week period, regardless of the duration of treatment. Additional analyses are being examined to determine ideal treatment duration to maximize benefits and minimize costs.

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0606

FATIGUE OR EXCESSIVE DAYTIME SLEEPINESS, WHICH IS MORE RELATED WITH DEPRESSION?

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Introduction: Fatigue and excessive daytime sleepiness (EDS) were often regarded as having almost similar meaning in routine daily life. However, these two terms are strictly distinct concepts. The effect on depression between EDS and fatigue, which coexist depending on the situation or exist individually. We aimed to investigate both fatigue and EDS were classified in detail to determine which is more related to depression in the general population.

Methods: A total of 2,493 participants (female: 1,257) (47.90 ± 0.33 years old) were investigated nationwide, across 15 South Korean districts using face-to-face interviews survey. Fatigue, EDS, and depression were evaluated using the Fatigue Severity Scale (FSS), Epworth sleepiness scale (ESS), and Patient Health Questionnaire-9 (PHQ-9), respectively. The covariates such as sleep habits and socio-behavioral factors were included.

Results: The prevalence of depression (PHQ-9 ≥ 10) was 8.42% (n = 210). Fatigue (FSS ≥ 36) was 30.8% (n = 767). EDS (ESS ≥ 11) was 15.3% (n = 382). The prevalence of depression was following four categories; EDS with fatigue (E+F+) (n = 67, 31.9% vs. 7.3%) (P < 0.001), fatigue without EDS (E-F+) (n = 71, 33.8% vs. 20.3%) (P < 0.001), EDS without fatigue (E+F-) (n = 16, 7.6% vs. 5.8%) (P = 0.294), and absence of fatigue and EDS (E-F-) (n = 56, 26.7% vs. 66.6%) (P < 0.001). After adjusting for covariates, the presence of depression (E-F-, reference) was associated with E+F+ (OR 8.804, 95% CI 5.818-13.321), E-F+ (OR 3.942, 95% CI 2.704-5.747), and E+F- (OR 2.812, 95% CI 1.542-5.131). We additionally performed logistic regression according to two categories. There was no significant difference of prevalence of depression between E+F- (reference) and E-F+ (OR 1.399, 95% CI 0.760-2.575).

Conclusion: Although fatigue and EDS were associated with depression regardless of the presence of each other. But we did not find out which is more related with depression.

Support (if any):

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0607

IMPROVEMENT IN SLEEP LATENCY WITH FT218 (ONCE-NIGHTLY SODIUM OXYBATE): ANALYSIS FROM THE PHASE 3 REST-ON CLINICAL TRIAL

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Introduction: In the phase 3 REST-ON trial (NCT02720744), mean sleep latency on the Maintenance of Wakefulness Test

(MWT) was significantly improved vs placebo with investigational, extended-release once-nightly sodium oxybate (FT218 [ON-SXB]; P < 0.001). This post hoc analysis assessed response to treatment and improvement in excessive daytime sleepiness (EDS).

Methods: Participants (≥16 years) with narcolepsy type 1/2 were randomized 1:1 to double-blind ON-SXB or placebo. Doses were 4.5 g week 1, 6 g weeks 2–3, 7.5 g weeks 4–8, and 9 g weeks 9–13. Mean sleep latency on the MWT was measured in 5 trials up to 30 minutes each at baseline and weeks 3, 8, and 13. Percentage of participants with improvement of ≥5, ≥10, ≥15, and ≥20 minutes from baseline and with mean sleep latency=30 minutes were assessed. Two-sided P values were calculated using Fisher exact test.

Results: The modified intent-to-treat population included 190 participants (ON-SXB, n=97; placebo, n=93). At baseline, mean (SD) sleep latency was as follows: ON-SXB, 5.0 (3.1) minutes; placebo, 4.7 (2.6) minutes. More participants receiving ON-SXB vs placebo had mean MWT=30 minutes at weeks 3 (6 g; 5.7% vs 0%; P < 0.05), 8 (7.5 g; 10.5% vs 1.3%; P < 0.05), and 13 (9 g; 13.2% vs 5.1%; P=0.14). A significantly greater percentage of participants receiving ON-SXB vs placebo had improved mean sleep latency ≥5 to ≥20 minutes over baseline at all doses (6 g: ≥5 min, 57.5% vs 25.0%; ≥10 min, 35.6% vs 9.1%; ≥15 min, 18.4% vs 3.4%; ≥20 min, 10.3% vs 1.1% [all P < 0.01]; 7.5g: ≥5 min, 63.2% vs 28.2%; ≥10 min, 43.4% vs 11.5%; ≥15 min, 31.6% vs 3.8%; ≥20 min, 15.8% vs 1.3% [all P < 0.001]; 9 g: ≥5 min, 66.2% vs 37.2% [P < 0.001]; ≥10 min, 50.0% vs 19.2% [P < 0.001]; ≥15 min, 32.4% vs 10.3% [P < 0.01]; ≥20 min, 17.6% vs 6.4% [P < 0.05]).

Conclusion: Clinically significant improvements in EDS occurred with 6-, 7.5-, and 9-g doses of ON-SXB. At the 2 highest doses, >10% of participants remained awake for the entire MWT. If ON-SXB is granted FDA approval, adults with narcolepsy will have a once-nightly treatment to improve EDS.

Support (if any): Avadel Pharmaceuticals

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0608

PAX8/PAX8-AS1 DNA METHYLATION LEVELS ARE NOT ASSOCIATED WITH SLEEP DURATION IN MEDICATED PATIENTS WITH UNEXPLAINED HYPERSOMNOLENCE

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Introduction: The biological basis of daytime sleepiness and excessive sleep duration in patients with unexplained hypersomnolence is unknown. However, a growing body of evidence suggests modulations in the epigenome coincide with objective measures of sleep, suggesting epigenetic mechanisms may be related to hypersomnolence. Previously, we identified significant correlations between saliva DNA methylation abundance at nine CpG sites located in the PAX8/PAX8-AS1 genes and total sleep time measured using polysomnography in unmedicated, clinical patients with unexplained hypersomnolence. Since psychotropic medications frequently affect clinical sleep testing and may also affect DNA methylation, here we attempted to replicate prior findings in a separate, medicated sample.

Methods: Forty-three medicated clinical patients with unexplained hypersomnolence were drawn from a larger study of a multimodal sleep assessment that included ad libitum overnight

polysomnography. Pyrosequencing quantified DNA methylation at the previously identified CpG sites in PAX8/PAX8-AS1. Multivariate linear models, adjusting for age, sex, and body mass index (BMI), assessed relationships between total sleep time and DNA methylation at these prespecified CpG sites.

Results: Participants were young -to middle-aged (Mean Age = 32.2 ± 10 years) and predominantly female (Percent Female = 95.3%), with a mean BMI of $27.8 \pm 5.4 \text{ kg/m}^2$. Epworth Sleepiness Scale (ESS) score was consistent with complaints of daytime sleepiness (Mean ESS = 15.1 ± 4.3). Total sleep time on ad libitum polysomnography was 9.2 ± 1.7 hours (range 5.6-12.8 hours). No significant associations between DNA methylation at the PAX8/PAX8-AS1 CpG sites and sleep duration were identified in adjusted models.

Conclusion: We were unable to replicate findings of an association between sleep duration and DNA methylation levels at specific PAX8/PAX8-AS1 CpG sites in medicated patients with unexplained hypersomnolence. Further research to clarify whether this is a result of medications affecting the DNA methylation levels at these CpG sites or previously identified associations between DNA methylation of PAX8/PAX8-AS1 and sleep length are spurious will require replication of prior findings in a novel unmedicated cohort and quantification of within-subjects effects of psychotropic medications on DNA methylation levels in genes of interest.

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0609

SAMELISANT, HISTAMINE 3 RECEPTOR AGONIST FOR THE POTENTIAL TREATMENT OF EXCESSIVE DAYTIME SLEEPINESS IN PATIENTS WITH NARCOLEPSY

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Introduction: Samelissant (SUVN-G3031) is a potent and selective histamine 3 receptor inverse agonist. In orexin knockout mice, samelissant produced wake-promoting and antcataplectic effects suggesting its potential therapeutic utility in the treatment of narcolepsy. Safety and tolerability studies in animals and healthy human volunteers suggested a favorable risk/benefit profile for samelissant.

Methods: Samelissant is currently being evaluated in a double blind, Phase-2 proof of concept study in USA and Canada for narcolepsy with or without cataplexy (ClinicalTrials.gov Identifier: NCT04072380). The study is recruiting subjects diagnosed with narcolepsy as per ICSD-3 criteria, aged between 18 to 65 years with an Epworth Sleepiness Scale (ESS) score of ≥ 12 and mean Maintenance of Wakefulness Test (MWT) time of < 12 min. A total of 171 subjects are expected to be randomized into 3 treatment arms (placebo, samelissant 2 mg and samelissant 4 mg) in 1:1:1 ratio. Each subject will receive either placebo or study drug once daily for 2 weeks. The primary efficacy endpoint is change in MWT score from baseline to week 2. Key secondary endpoint is change in ESS from baseline to week 2. Safety will be monitored throughout the study by medical monitor and by data safety monitoring committee. As the study is still recruiting, demographics and baseline characteristic data for the currently enrolled subjects is summarized

descriptively. Since the study is blinded, a breakdown of baseline characteristics by treatment group will not be available until after completion.

Results: At the data cutoff date of Nov 30, 2022, a total of 155 subjects were randomized in the study. The median age of subjects was 30 years (range: 18-57 years) with mean BMI of 28.5 kg/m^2 (range: 18.3- 43.9 kg/m^2). Overall, 57% subjects were of narcolepsy type-1, 71% were female and 71% were Caucasian. Mean (SD) baseline values of MWT and ESS scores were 6.1 (4.4) and 17.2 (2.8), respectively.

Conclusion: Baseline characteristics are consistent with the general narcolepsy population. The study is currently enrolling subjects with narcolepsy and the data readout is expected in Q2 2023.

Support (if any):

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0610

THE EFFECTS OF WAKEFULNESS PROMOTING AGENTS ON NEURONAL ACTIVITY IN NUCLEUS ACCUMBENS

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Introduction: Both modafinil and methylphenidate are frequently utilized for maintenance of wakefulness in narcolepsy and other sleep disorders. Both have been demonstrated to affect dopamine transporter, leading to an increase extracellular dopamine. Subsequent functional connectivity changes between nucleus accumbens and pallidum are noted. Animal studies demonstrate changes in neuronal activity with methylphenidate in nucleus accumbens. To our knowledge there has been no direct examination of human neural activity in nucleus accumbens after administration of modafinil or methylphenidate, compared to baseline.

Methods: Two subjects with placement of stereotactic electroencephalographic (sEEG) electrodes to identify optimal location for permanent deep brain stimulation electrodes in nucleus accumbens were given wakefulness promoting agents to optimize testing of stimulation sites during inpatient hospitalization. Assessment occurred at least 48 hours following surgical electrode insertion under inhaled general anesthesia. Retrospective analysis was performed on neural activity in nucleus accumbens during rest on and off medication. Frequency content was calculated in the following bands: delta (1-3 Hz), theta (4-7 Hz), alpha (8-12 Hz), beta (13-30 Hz), gamma (30-50 Hz), and high gamma (70-100 Hz). Power in each band is reported as the percentage contribution of each band to summed power across all bands.

Results: Total power was noted to be lower with both modafinil and methylphenidate. With modafinil, the beta band ratio was decreased (22.3% vs. 30.5%), the gamma band ratio was increased (24% vs. 22.4%), and the high gamma band was increased (39.5% vs. 32.9%). With methylphenidate, only the high gamma band was increased (40.3% vs. 22.9%).

Conclusion: Both methylphenidate and modafinil increase high gamma band neural activity in nucleus accumbens, while modafinil has additional effects on beta and gamma bands. Further assessment of modafinil and methylphenidate's effects on neural activity are indicated to help better understand their mechanism of action and appropriate use as wakefulness promoting agents.

Support (if any):

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0611

TREATMENT SATISFACTION AND PREFERENCES IN PEOPLE WITH NARCOLEPSY TRANSITIONING FROM SODIUM OXYBATE TO LOWER-SODIUM OXYBATE

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Introduction: Lower-sodium oxybate (LXB; Xywav®), which contains the same active moiety as higher-sodium oxybate (SXB; Xyrem®) but with 92% less sodium, is approved by the US Food and Drug Administration (FDA) for treating cataplexy or excessive daytime sleepiness in patients ≥7 years of age with narcolepsy. LXB is recognized as clinically superior to SXB in narcolepsy by the US FDA due to lower chronic sodium exposure; however, real-world data describing patient preferences and satisfaction are lacking.

Methods: Transition Experience of persons with Narcolepsy taking Oxybate in the Real-world (TENOR; NCT04803786) was a patient-centric, prospective, observational, noninterventional, virtual-format study of US adults with narcolepsy (type 1 or 2) transitioning from SXB to LXB within the previous/upcoming 7 days. Longitudinal data collected during transition and for 21 weeks thereafter included responses to the Ease of Switching Medications Scale (EOSMS), Forced Preference Questionnaire (FPQ), and Treatment Satisfaction Questionnaire for Medication-version II (TSQM-vII).

Results: The mean (standard deviation [SD]) age of the 85 participants (narcolepsy type 1, n=45; narcolepsy type 2, n=40) was 40.3 (13.0) years; most were female (73%) and White (87%). Mean (SD) time on current SXB regimen was 57.8 (52.1) months. Nearly all participants took SXB (82/85, 96%) twice nightly prior to transition and LXB (82/84, 98%) twice nightly after transition. Most participants (61/73, 84%) reported that switching from SXB to LXB was “extremely easy, not difficult at all” or “easy” on the EOSMS, and most (59/73, 81%) preferred LXB to SXB on the FPQ. Among participants who preferred LXB, lower sodium content (56/59, 95%) and fewer cardiovascular issues (27/59, 46%) were cited as the most common reasons. There were minimal mean (SD) changes in TSQM-vII scores for global satisfaction (1.1 [18.6]), satisfaction with effectiveness (1.0 [16.8]), side effects (4.1 [23.7]), or convenience (−3.9 [15.2]) after transitioning from SXB to LXB.

Conclusion: Overall, most participants indicated that switching from SXB to LXB was “easy” or “extremely easy.” Most participants preferred LXB to SXB, primarily because of its lower sodium content. Satisfaction with oxybate treatment was maintained following transition to LXB.

Support (if any): Jazz Pharmaceuticals

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0612

UNDERSTANDING NARCOLEPSY TREATMENTS FROM THE PATIENT'S PERSPECTIVE: A SURVEY OF PEOPLE LIVING WITH NARCOLEPSY

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Introduction: Individuals with narcolepsy were surveyed to better understand desired treatment outcomes and how those outcomes map to commonly experienced symptoms, treatment awareness, and medication usage.

Methods: In February 2022, an email invitation to a 27-question online survey was sent to US members of MyNarcolepsyTeam, a social network of >9,800 members.

Results: In total, 110 members completed the survey. The most frequently mentioned desired treatment goals aligned with the most commonly reported symptoms: being able to stop sleeping during the day (77%); increased energy (62%); improved memory (36%); improved productivity (29%); improved sleep continuity (22%); and for patients with narcolepsy type 1, reducing cataplexy (28%). A common theme was desire for a medication that would treat the underlying cause and not just improve specific symptoms. In one patient's own words: “I want to see treatments that target the root problem of poor nighttime sleep rather than just being a band-aid for [excessive daytime sleepiness] EDS, like stimulants are.” Only a small percentage of respondents (13%) were not currently taking any type of medication to address narcolepsy symptoms. 64% were currently taking ≥2 medications to address both the daytime and nighttime symptoms. Most commonly mentioned current treatments were dextroamphetamine-amphetamine (30%), modafinil (22%), melatonin (16%), armodafinil (15%), venlafaxine (14%), and oxybate (14%). Notably, 33% of patients taking sodium oxybate chose sleeping through the night as a desired outcome. Most common sources for learning about treatments were narcolepsy-specific websites (53%), MyNarcolepsyTeam specifically (45%), the patient's doctor (42%), scientific articles (42%), and advocacy groups (37%).

Conclusion: Patients experience a wide range of both daytime and nighttime symptoms and seek relief from both sets of symptoms including EDS (93%), fatigue (79%), cognitive challenges (74%), as well as sleep disruptions (63%). As a result, the majority need multiple medications. Understanding the experiences and needs of people with narcolepsy provides significant opportunities for clinicians to support, educate, and treat their patients holistically. Additionally, content readily available on the internet, whether it is narcolepsy-specific content or social networks, helps patients proactively discuss options with their clinician.

Support (if any): Avadel Pharmaceuticals

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0613

ACTIGRAPHY-BASED SLEEP DISRUPTION AND DIURNAL BIOMARKERS OF AUTONOMIC FUNCTION IN PAROXYSMAL ATRIAL FIBRILLATION

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Introduction: Sleep architectural disruption is associated with atrial fibrillation (AF), however, associated autonomic influences remain unclear and it is unknown if this detriment persists during wakefulness. We hypothesize diurnal-patterned associations of sleep disruption and autonomic dysfunction in patients with paroxysmal AF

Methods: We analyzed data from the Sleep Apnea and Atrial Fibrillation Biomarkers and Electrophysiologic Atrial Triggers (SAFEBEAT) study designed to examine paroxysmal AF and sleep apnea involving simultaneous collection of continuous electrocardiogram monitoring (Heartrak Telemetry®) and actigraphy (Actiwatch GTX) for 7-21 days. Heart rate variability (HRV) measures in frequency and time domains were used as surrogates of autonomic function and averaged per sleep/wake per day. A linear mixed-effects model assuming compound symmetry correlation structure was used to assess the relationship of HRV with actigraphy-derived sleep data.

Results: The analytic sample (age 60.1 ± 12 years, body mass index 32.6 ± 6.7 kg/m², 36% female, 75% White) included 108 participants with paroxysmal AF. Significant associations were observed between sleep indices and HRV measures during wakefulness: a) Sleep latency with high-frequency power (HFP), b) total sleep time, wakefulness after sleep onset (WASO) and number of awakenings with low-frequency power (LFP), and c) Sleep efficiency with standard deviation of normal R-R intervals (SDNN) and coefficient of variation (CV). During sleep, a) total sleep time was associated with LFP/HFP ratio (LHR), and b) number of awakenings with LHR. Significant sleep-wake interactions were observed between a) Sleep latency and HFP, b) Sleep efficiency with SDNN and CV, c) WASO with SDNN, CV, and LFP, and d) number of awakenings with CV and LFP.

Conclusion: Our novel findings indicate actigraphy-based measures of sleep disruption were associated with autonomic function alterations and these relationships exhibited diurnal variability in patients with paroxysmal AF. Results provide unique insights into differential relationships of immediate (during sleep) versus sustained (during wakefulness) autonomic dysfunction related to sleep disruption which may contribute to atrial arrhythmogenesis

Support (if any):

Abstract citation ID: zsad077.0614

0614

CHARACTERIZING SLEEP IN EARLY-MORNING SHIFT WORKERS AT RISK FOR SHIFT WORK DISORDER

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Introduction: Shift work is increasingly common in our 24/7 society and can cause sleep disturbances and excessive sleepiness. Roughly 10-43% of shift workers are diagnosed with shift work disorder (SWD), characterized by excessive sleepiness accompanied by reduced sleep duration and/or insomnia. While more individuals work early morning shifts (shift start 3-6AM) compared to overnight shifts, few studies have investigated this population. The aim of this study was to characterize sleep in a population of early-morning shift workers.

Methods: We characterized sleep in early-morning shift workers (18-65yrs) from New England who were screened for a clinical trial of a wake-promoting agent. Pre-screening consisted of the Epworth Sleepiness Scale (ESS) and a Shift Work Disorder Questionnaire (SWD); screening consisted of the Pittsburgh Sleep Quality Index Questionnaire (PSQI); a physical exam including an ECG, CBC, urinalysis, and comprehensive metabolic panel; a home sleep test (HST), a Monitored Wakefulness Test (MWT); a physician evaluation of their excessive sleepiness (Clinical Global Impression [CGI]); and a self-evaluation regarding how sleepiness affected their everyday life (Patient Global Impression [PGI]). Only data from consented individuals who met the initial inclusion criteria of being high risk for SWD were included in the analysis.

Results: 158 early-morning shift workers met the pre-screening criteria and began the screening process. Most worked in retail, healthcare, maintenance, or transportation, and worked five shifts (65%) and 40+ hours (72%) per week, with a duration of 8.8 ± 1.9 hours. 41 were screened out for abnormal findings on the PE, ECG, or screening blood/urine tests; 26 were screened out for previously un-diagnosed OSA or PLMD; 4 were ineligible for other reasons; 7 were excluded after their MWT due to long sleep latency, 20 were lost to follow-up/withdrew and 60 completed screening and met inclusion criteria. Their average ($\pm$ sd) age was 37 ± 11 years, 45% women, PSQI score 7.5 ± 2.7 , sleep duration 5.6 ± 1.0 , ESS= 16.3 ± 3.1 , CGI= 4.2 ± 0.9 , PGI= 3.6 ± 1.1 .

Conclusion: Early-morning shift workers at an increased risk for SWD report short and disturbed sleep, excessive sleepiness, and a negative impact of sleepiness on their quality of life. Many have undiagnosed OSA and PLMD.

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0615

RACIAL/ETHNIC AND SEX DIFFERENCES IN CIRCADIAN REST-ACTIVITY RHYTHM PATTERNS: FINDINGS FROM A SAMPLE OF THE US POPULATION

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Introduction: Circadian disruptions are associated with increased risk for morbidity and mortality. However, it is unclear whether these associations vary by race/ethnicity. We aim to explore, 1) Examine whether rest-activity rhythm (RAR) patterns vary across race/ethnicity among a representative sample of the US adult population, and 2) Examine the interaction of race/ethnicity and sex in RAR patterns.

Methods: The study was based on the National Health and Nutrition Examination Survey (2013–2014) with data from participants who wore a physical activity monitor (PAM ActiGraph accelerometer model GT3X+) continuously for seven consecutive days. After excluding pregnant participants and those with sleep minutes < 120 and >1200, the analytic sample included was 4,722 adults. The cosinor method was used based on PAM minutes time-series data to RAR outcome variables: mesor, amplitude, acrophase, and robustness. The main predictor of interest was race/ethnicity (Asian, Black, Hispanic, multi/other, and White). A sex-race/ethnicity interaction was tested to assess if racial/ethnic differences in RAR patterns differ between males and females. Other covariates included were age, marital status education federal poverty level, and employment status. Eight adjusted Generalized linear models (GLM) : four with race/ethnicity as the main predictors and four multiplicative interaction models with the product term of race/ethnicity and sex. An adjusted Wald test was used to test for interaction.

Results: Compared with White adults, Hispanic adults had increased mesor levels ($\beta=0.10$; 95% CI:0.07;0.13), increased RAR amplitude ($\beta=0.10$; 95% CI:0.06;0.13), and increased robustness ($\beta=0.07$; 95% CI:0.03;0.11) whereas Black adults had decreased amplitude ($\beta=-0.11$; 95% CI:-0.16;-0.07) and decreased robustness ($\beta=-0.14$; 95% CI:-0.20;-0.09) compared to White adults. Similarly, Asians had decreased amplitude ($\beta=-0.06$; 95% CI:-0.10;-0.01) and decreased robustness ($\beta=-0.11$; 95% CI:-0.16;-0.06). A significant sex-race/ethnicity interaction was found for amplitude $F(4,12)=3.94$; $p=0.029$ and robustness $(4,12)=6.02$; $p<0.001$.

Conclusion: RAR is associated with race/ethnicity, and this association varies by sex. Notably, Hispanic adults had increased mesor, amplitude, and robustness compared to Whites. Conversely, Black and Asian populations shared decreased amplitude and robustness compared to Whites. Future studies may consider further investigation of circadian health by race/ethnicity and sex for community intervention.

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0616

THE REST-ACTIVITY RHYTHM AND ITS ASSOCIATION WITH METABOLIC SYNDROME IN MIDLIFE ADULTS

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Introduction: Metabolic syndrome (MetS) in middle-aged adults increases a risk of cardiovascular disease in their older ages. The rest-activity rhythms disruptions have been linked to metabolic dysfunctions. However, there are limited data for the association between rest-activity rhythms and MetS in middle-aged. The purpose of this analysis was to compare rest-activity rhythms between midlife adults with MetS and those without MetS.

Methods: This study was a secondary analysis of data from Midlife in the United States (MIDUS 2): Biomarker Project, 2004-2009 cohort. The rest-activity rhythms were described by four parameters: the mesor, the amplitude, the acrophase, and the goodness-of-fit (R²), generated from Cosinor analysis using Actiwatch activity monitor data. Metabolic syndrome was defined as having three or more the following traits: the waist circumference ≥ 85 cm in women and ≥ 102 cm in men, the triglyceride level ≥ 150 mg/dL, the high-density lipoprotein < 50mg/dL in women and < 40mg/dL in men, the blood pressure $\geq 130/85$ mmHg, the fasting blood sugar level ≥ 100 mg/dL. Student T-test were conducted.

Results: The sample (N=302; mean age 54.7 years [range 34 – 83]; 55.3% female; 97.3% White; 72.8) consists of 60.9% of persons with MetS (n=184) and 39.1% of those without MetS (n=118). The MetS group was older and more likely to be male than the non-MetS group (all $p<.05$). The MetS group had statistically lower mesor (mean 221.7 vs. 246.1; $p=.005$) and amplitude (mean 183.1 vs. 207.9; $p=.004$) than the non-MetS group. R square (0.58 vs. 0.62; $p=.004$) was significantly lower in the MetS than the non-MetS group. However, acrophase was not associated with MetS.

Conclusion: Midlife adults, those with MetS had lower levels of average activity and lower amplitude of rest-activity rhythms than those with non-MetS. The circadian rest-activity rhythms were significantly fragmented in those with MetS than with those non-MetS. Our findings suggest that the disrupted rest-activity rhythm could be a modifiable factor to manage MetS in midlife.

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0617

TRACKING CIRCADIAN PHASE FOR PERSONALIZED SCHEDULES: A PRECISE MEDICAL APPROACH TO REDUCE CIRCADIAN MISALIGNMENT IN SHIFT WORKERS

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Introduction: Night shift workers experience symptoms of excessive sleepiness and insomnia due to misalignment between the work schedule and their circadian clock. Circadian misalignment can be corrected using exposure to bright light delivered in accordance with a phase response curve. Given the high

variability of circadian phase in night shift workers, using a one-schedule-fits-all approach to light therapy might result in significant error (e.g., phase shifts in the wrong direction). Instead, a personalized light exposure schedule should result in more consistent and precise phase shifts. This randomized controlled trial compared personalized and non-personalized light schedules in shifting circadian phase in night shift workers.

Methods: Individuals with shift work disorder (ICSD-3 diagnostic criteria) were randomized into two conditions: personalized light therapy, or non-personalized light therapy control. Personalized light schedules were based on estimates of dim light melatonin onset (DLMO) derived from mathematical modeling of activity data collected via an Apple Watch. Estimates were confirmed with in-lab DLMO. Light schedules were delivered through a mobile app (SHIFT) that updated in accordance with real-time estimates of DLMO. Participants were provided a light box as a source of bright light at night and light blocking glasses. Phase shifts were determined based on in-lab DLMO measured before and after treatment.

Results: Those who received personalized light therapy treatment achieved a larger phase delay (Mean = 7.37 hours, SD = 3.03 hours) compared to those in the non-personalized light therapy control group (Mean = 0.84 hours, SD = 3.46 hours), $t(5) = 2.501$, $p = 0.05$.

Conclusion: Preliminary results suggest that personalized light therapy may be a more effective treatment to correct circadian misalignment in night shift workers by delivering treatment according to each individual's unique circadian phase. This has implications for improving the symptoms of shift work disorder and quality of life for this population.

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0618

ARE WE FAILING OUR NIGHT SHIFT WORKERS?: A LOOK INTO THE UNMET NEEDS OF OUR NIGHT SHIFT WORK FORCE

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Introduction: Many night shift workers experience poor health and safety concerns associated with circadian misalignment, which is driven by an inverted sleep-wake schedule. This work schedule leads to symptoms of excessive sleepiness and insomnia which have devastating consequences, including job dissatisfaction and social impairments. Past research has focused on circadian misalignment as the predominantly cause of shift work disorder; however, circadian misalignment is only one factor in the ecology of night shift work. A more inclusive model would consider other socioecological factors that may also influence the feasibility and effectiveness of interventions. This study utilized a patient-centered framework to probe the impacts of night shift work beyond symptoms of shift work disorder.

Methods: Five focus groups comprising of 20 individuals with shift work disorder (ICSD-3 diagnostic criteria) were conducted. Participants were asked about their job satisfaction levels, employee support, and problems associated with shift work. Thematic analysis was done, and sample quotes were pulled to

indicate levels of support and other barriers associated with shift work.

Results: Analysis revealed four main themes regarding non-sleep related impairments of night shift work: isolation, poor health, cognitive and mood disorders, and altered sense of self. Participants reported greater instances of loneliness, weight fluctuations, short tempers, alterations in self-image, and other unfavorable effects from working nights. A significant number of participants additionally indicated very little to no support or education from employers regarding their night shift work.

Conclusion: The combined results of the focus groups highlight the unmet needs of night shift workers. These data indicate that night shift workers are an under-served and under-resourced sector of our workforce, and that circadian interventions for shift workers should measure impact on quality of life beyond sleep and sleepiness. Given their critical roles in sustaining 24-7 access to essential services, it is imperative that we develop evidence-based interventions for night shift workers.

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0619

COMPARATIVE ANALYSIS OF DIFFERENT METHODS OF ASSESSING WORKER FATIGUE.

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Introduction: Fatigue at work causes reduced functional capacity that is experienced during the workday, is associated with sleep deprivation and impairs decision making. Fatigue can be estimated in a self-reported way, through the Psychomotor Vigilance Test (PVT), postural balance and core body temperature (CBT) that correlate with performance. Interest in fatigue assessment should focus on identifying risk conditions. Thus, the objective of the study is to present comparative results of 4 different methods used to estimate fatigue.

Methods: This study was approved by Research Ethics Committee (protocol CAAE n° 97394818.6.0000.5149). The sample consisted of 47 volunteers, who worked as truck operators, in a fast reverse rotational shift (4x1) with a workload for each shift of 6 hours, including a 12-hour break between shifts. All workers were submitted to fatigue assessment by postural sway using the Sonômetro for 15 days, in addition to assessments for 5 days such as CBT monitoring, 5 minutes of PVT and karolinska sleepiness scale (KSS). The gamma distribution with the identity function was considered for data analysis through the method of generalized linear models.

Results: CBT measurements were compared from the first to the sixth hour between shifts, no significant differences were observed. Of the variables evaluated by PVT, only the 10% faster presented worse results in the night shift (00:00 to 06:00). The KSS showed no differences between the evaluated times. The result of the pairwise comparisons indicated that there are differences in postural sway by SONOMETRO, being greater at the beginning of the shift 00:00 to 06:00, in relation to the shift 12:00 to 18:00. In the middle and at the end of the shift, a difference was found between the shift 00:00 to 06:00 and all others.

Conclusion: Among the presented methods, the SONOMETER and a single variable of PVT (10% faster), identified differences in the levels of fatigue. It is up to managers to identify the method that best suits the objective of the assessment, as well as the local culture and conditions. Thus, the combined use of different risk and fatigue assessment and management methods may favor the identification and management of worker fatigue.

Support (if any):

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0620

DIM LIGHT MELATONIN ONSET ANALYSIS IN INDIVIDUALS DIAGNOSED WITH DELAYED SLEEP-WAKE PHASE DISORDER (DSWPD)

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Introduction: We are conducting a double-blind, randomized, clinical study in Delayed Sleep-Wake Phase Disorder (DSWPD) participants with extensive clinical phenotyping. We evaluated screening Dim Light Melatonin Onset (DLMO) assessments in participants with a DSWPD diagnosis to determine the proportion of participants with and without a circadian delay.

Methods: Delayed DLMO is DLMO occurring after or within 30 minutes before desired bedtime, and after 21:30. Each DLMO assessment consisted of eight saliva collections performed at five, four, three, two, and one hour before bedtime, at planned bedtime, and one and three hours after bedtime. Salivary DLMO assessments were distributed to participants at Visit 1 (screening) and Visit 3 (treatment) with a questionnaire to record planned and actual collection times. Participants were instructed to wear blue-light blocking glasses during the assessment period. The Morningness-Eveningness Questionnaire (MEQ) was also completed by participants at V1 to evaluate circadian and sleep rhythm patterns. DLMO was calculated for each phase assessment and defined as the clock time when the melatonin concentration exceeded the mean of three low consecutive values, plus twice the standard deviation of these points.

Results: Thirty-four participants with DSWPD completed the screening DLMO assessment, 33 of which had a delayed DLMO (97.06%). Sub-analyses were conducted on participants with DSWPD who had delayed DLMO (n = 33). Within this subset, the average DLMO time was 23:52 (SD = 1:58) and the average MEQ score was 34.27 (SD = 10.39). Of these 33 participants, 14 had a DLMO time after 00:00 (42.42%).

Conclusion: These initial data indicate that, on average, participants with DSWPD that completed the screening DLMO assessment had delayed DLMO. Further analyses show that almost half of this subset had a significantly delayed DLMO (00:00 or later). This study is currently ongoing and blinded. Further data will be analyzed as more participants enroll. 'Phase typing' will be important in further understanding the underlying pathophysiology and in the treatment selection for patients with DSWPD.

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0621**A MACHINE LEARNING MODEL TO PREDICT THE RISK OF PERINATAL DEPRESSION FROM SLEEP DATA IN HEALTHY PREGNANT WOMEN**

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Introduction: Perinatal depression (PND) is a complication of pregnancy associated with serious health consequences for both mothers and their babies. Identifying predisposing factors for PND during early pregnancy is key to early detection of women who may be at greater risk of developing this condition. Machine Learning (ML) techniques have recently been applied in a few studies, mostly to predict postpartum depression. None of them, however, considered sleep data in model building, neither focused on PND.

Methods: By analyzing data from a multicenter, prospective cohort study on sleep and mood changes during the perinatal period (the "Life-ON" study), we constructed a ML model for PND risk prediction and tested it in a cross-validation setting. PND was assessed using an EPDS score >12 during 9 visits from early pregnancy until 6 months postpartum. In a bivariate analysis, 47 sociodemographic, psychological, blood-based, medical/gynecological, and subjective sleep variables, collected from 439 pregnant women (33.7±4.2 yrs.) during the first trimester of gestation, as well as 33 polysomnographic (PSG) parameters, recorded from 353 women (33.6±4.2 yrs.) during the second trimester, were correlated with PND. A support vector machine (SVM) model was then trained using the 10-features with the highest permutation importance to predict the individual risk of PND for each woman.

Results: Among all variables considered, sleep quality (PSQI) and insomnia symptoms (ISI) ($p < 0.001$), daytime sleepiness (ESS) and RLS severity (IRLS) ($p < 0.05$), as well as the PSG parameters Apnea Index ($p = 0.001$), number of central hypopneas and percentage of sleep stage N2 ($p < 0.05$), were all positively correlated to PND. The PSQI and ISI scores were also selected by the SVM classifier, which achieved a mean AUROC of 0.777 and an AUPRC of 0.393, corresponding to a sensitivity of 54.3% and a specificity of 82.6% in identifying women at risk for PND.

Conclusion: In our data-driven ML model to predict the risk of PND during early pregnancy, subjective poor sleep quality and insomnia symptoms identified women at greater risk of developing PND, while none of the PSG variables improved model performance.

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0622**CLUSTERING BIPOLAR DISORDER RISK VARIANTS BY THEIR EFFECT ON SLEEP AND CIRCADIAN TRAITS.**

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Introduction: Bipolar disorder (BD) is a mood disorder that causes noticeable, sometimes extreme, changes in mood and behaviour. BD affects nearly 50 million individuals worldwide including 2-4% of the US population. Previous studies have reported sleep and circadian disturbances in patients with BD. Genetic studies have identified 63 risk variants for bipolar disorder (BD).

Methods: To enable new insights into BD disease causing pathways, we clustered BD risk variants by their effect on sleep and circadian rhythm traits. A Bayesian soft-clustering approach was used to determine if BD variants cluster according to effect on eight subjectively and two objectively measured sleep and circadian traits (using sleep and circadian trait GWAS from the UK Biobank in European ancestry, $n = 453,000$).

Results: We found evidence of genetic correlation between BD and sleep/circadian traits ($p < 0.05$). Bipolar risk variants cluster into two clusters based on their association with sleep and circadian traits. The two clusters are: Cluster 1: late chronotype, shorter time in bed (by actigraphy), difficulty waking up, longer sleep duration (self-report), longer periods of daytime sleepiness, longer and frequent naps and increasing insomnia and Cluster 2: early chronotype, longer time in bed (by actigraphy), longer sleep duration (self-report) and less insomnia. In general, cluster 1 appears to be contributing to sleep insufficiency, while cluster 2 appears to be contributing to hypersomnia or more "typical" sleep.

Conclusion: In conclusion, sleep and circadian trait clusters indicate bipolar genetic risk may function through two distinct mechanisms. Some genetic risk variants appear to be related to sleep insufficiency, while others are related to hypersomnia, suggesting that it may be possible to genetically subtype BD. This finding may allow classification of BD-patients by distinct genetic pathways linking to their sleep-circadian disturbances, potentially offering a way forward toward genetically informed diagnosis, surveillance and management of BD-patients.

Support (if any): N/A

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0623

EFFECTS OF BRIGHT LIGHT THERAPY ON OBJECTIVE AND SUBJECTIVE SLEEP IN PATIENTS WITH NON-SEASONAL DEPRESSION AND EVENINGNESS

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Introduction: This study reported the effect of bright light therapy with gradual advanced timing on the sleep parameters in patients with major depressive disorder (MDD) and eveningness.

Methods: A total of 93 adults were randomized to receive either 10,000 lux bright light therapy (BLT group) or 50lux dim red light therapy (placebo group) for a total of 5 weeks. Timings of both treatments were initiated at their habitual wake time and was advanced gradually each week. Sleep diary data were collected weekly. Actigraphic data were collected at the baseline and during the last week of the 5-week treatment. Sleep parameters including time in bed (TIB), sleep onset latency (SOL), wake after sleep onset (WASO), total sleep time (TST) and sleep efficiency (SE) were extracted. Concordance of the sleep diary and actigraphy sleep parameters were assessed by Pearson's correlation with p-value adjusted for multiple comparisons. The changes of sleep parameters between the two groups were assessed by linear mixed model.

Results: Significant correlations between sleep diary and actigraphy were found for WASO ($r=0.35$, $p=0.01$) and TST ($r=0.40$, $p=0.01$), but no correlation was found for TIB, SOL and SE. A greater advance in the diary-based light-out time (group*time $p=0.03$, 15 vs 32min) and rise time (group*time $p=0.04$, 38 vs 53min) was found in the BLT group compared to placebo group, while diary-based WASO, TST and SE comparably improved with time in both groups. However, there were no significant difference between the two groups in all of the actigraphic parameters after treatment.

Conclusion: Five-week of either type of light therapy with gradual advance in timing improved subjective WASO, TST and SE, while BLT led to a greater advance in the light-out time and rise time when compared to the placebo group. These changes were not captured by the actigraphic measurements. The discrepancies between subjective and objective sleep parameters suggested the need to consider incorporating multiple measures when assessing sleep in patients with depression and eveningness.

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0624

SLEEP DURATION AND INSOMNIA PREDICT INCREASES IN DEPRESSION IN ADOLESCENTS AT SUBSEQUENT 3-MONTH INTERVALS: A LONGITUDINAL STUDY.

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Introduction: Adolescence is a critical developmental period for mental health, with the incidence of depression increasing significantly during this period. Both short sleep duration and insomnia are common and associated with depression risk. Longitudinal studies examining the relationship between sleep and depression in adolescents are scarce; therefore, the current study investigates the influence of sleep duration and insomnia on future increases in depressive symptoms.

Methods: A community sample of 151 never-depressed healthy adolescents (56.3% female; mean age = 14) were enrolled in 7th-9th grade (ages 11-15 years old) and followed for up to two years. On-line self-report questionnaires were collected every 3 months, including the Center of Epidemiology Studies Depression Scale (CES-D), the Insomnia Severity Index (ISI), and the Sleep Timing Questionnaire (STQ). The sleep item was excluded from the CES-D score used for analysis. Sleep duration was estimated through reported usual time in bed on the STQ (weighted average of weekdays and weekends). Separate mixed effects analyses examined whether time in bed or ISI predicted CES-D scores 3 months later, controlling for gender, age, and lag CES-D.

Results: Depression was associated with both time in bed ($t(736)=-2.8$, $p<0.005$) and Insomnia Severity Index ($t(736)=2.3$, $p=0.02$). For every one standard deviation decrease in time in bed, depression was predicted to increase by 0.15 points 3 months later. For every one standard deviation increase in Insomnia Severity Index, depression was predicted to increase by 0.12 points 3 months later.

Conclusion: The findings suggest that lower time in bed and higher insomnia predict increases of depression in the following 3 months. Given that sleep is a modifiable risk factor for depression, improving sleep health may help ameliorate depression during this high-risk period.

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0625

SLEEP WHEN THE BABY SLEEPS? THE EFFECT OF DAYTIME NAP BEHAVIORS ON POSTPARTUM DEPRESSION SEVERITY: A STRESS BUFFERING HYPOTHESIS

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Introduction: The early postpartum is a time of expected maternal sleep loss, normalized as part of infant care. While short

duration and disrupted nocturnal sleep are posited risk factors for postpartum depression (PPD), the role of daytime sleep remains less understood, despite the widespread recommendation that mothers sleep when their baby is sleeping. This study examined associations between napping, stress, and longitudinal PPD in a sample of healthy first-time mothers, using a prospective ambulatory field study design.

Methods: Fifty primiparous women (62% non-White; mean age=32 years) without a history of sleep disorders or psychopathology completed 10-days (9-nights) of actigraphy and sleep diaries at postpartum week 6. Sleep variables included nighttime duration and efficiency, and daytime nap frequency, timing and duration. Participants completed 3-days of superimposed ecological momentary assessment (EMA) rating naturalistic infant-related stressors (task demand; effort-reward-imbalance) at four daily intervals. Hierarchical mixed models tested whether daytime sleep characteristics predicted lower depression levels (via Edinburgh Postnatal-Depression Scale - EPDS) at 6-weeks, 8-weeks, and 3-months postpartum. Time-varying within-person covariates included time-of-day, baseline depression and anxiety (via Generalized-Anxiety-Disorder-7 scores), and previous night sleep. To test the putative stress-protective role of napping, we examined pre-post nap differences in EMA ratings.

Results: Sixty percent ($n = 30/47$) of women napped regularly ($>3 \times /1$ week, between 1-5 PM, < 90 min by both diary and actigraphy), rating 80% of these naps "intentional." Women with greater nap regularity at 6-weeks had lower depression levels at all timepoints (Betas = -2.4(1.6); -1.4(.5), -.5(.01) $ps < .001$, respectively), and less of an increase in depression symptoms at 3-months postpartum, compared to non-nappers [Beta(SE)=-1.2 (.5); $R^2=.21$; $p < .001$]. At 6-weeks, regular nappers reported lower stress post-nap (effort-reward-imbalance; demand) [Beta(SE)=-6.3(1.4); 1.2(.12), $R^2=.27$, .32, respectively; $ps < .01$].

Conclusion: This study demonstrates a contemporaneous mood-protective role of daytime sleep in a perinatal sample, using 24-hr objective sleep assessment coupled with daily assessments of naturalistic stressors. Moreover, these results provide support for the protective role of regular daytime sleep on development of PPD over time. Among new mothers who regularly nap, lowered post-nap stress may be one pathway through which daytime sleep buffers against PPD severity.

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0626

TYPE OF SCREEN TIME AND THE RELATIONSHIP BETWEEN ANXIETY, DEPRESSIVE AND INSOMNIA SYMPTOMS IN COLLEGE STUDENTS

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Introduction: Limited and conflicting evidence examines associations between screen time, depression, anxiety and insomnia in adolescents. Surprisingly few studies focus on college students who face unique sleep-related challenges, frequent media use and

elevated rates of mental health problems. Therefore, the goal of the present study was to examine the influence of different types of screen time on the relationship between anxiety/depressive symptoms and insomnia symptoms in college students.

Methods: Participants ($N = 1,085$ college students with a mean age of $M = 21.15$ [$SD = 5.51$]) completed questionnaires of demographics, anxiety, depression, insomnia, and daily screen time. Type of screen time was classified as: (1) social, (2) non-social, or (3) productivity. We conducted correlations and used Model 1 of the PROCESS macro version 3.5 was used to determine whether type of screen time moderated the relationship between depressive or anxiety symptoms and insomnia.

Results: Insomnia symptoms were moderately correlated with anxiety ($r = .49$, $p < .001$) and depressive symptoms ($r = .60$, $p < .001$). Anxiety symptoms were correlated with social screen time ($r = .09$, $p < .01$); depressive symptoms were correlated with non-social screen time ($r = .13$, $p < .001$). Social screen time moderated the relationship between anxiety symptoms and insomnia symptoms ($b = -.03$, $SE = .01$, $p = .01$) and the relationship between depressive symptoms and insomnia symptoms ($b = -.02$, $SE = .01$, $p = .02$). Productivity and non-social screen time were not significant moderators.

Conclusion: Anxiety symptoms were only correlated with social screen time whereas depressive symptoms were only correlated with using non-social screen time. Moderation analyses revealed social screen time moderated the relationship between anxiety/depressive symptoms and insomnia symptoms. Elevated social screen time was associated with elevated insomnia symptoms among participants with less anxiety/depressive symptoms. Distinguishing between non-social and social screen time may be relevant when examining the influence of screen time on depressive/anxiety symptoms and their relationship with insomnia symptoms. Further research could address these findings in a clinical sample and examine whether intervening on specific types of screen time impacts the relationship between depression/anxiety and insomnia.

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0627

POSTPARTUM INSOMNIA AND POOR SLEEP QUALITY ARE UNIQUELY PREDICTIVE OF POSTPARTUM MOOD DISORDERS

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Introduction: Many postpartum women experience symptoms of depression (PPD) and anxiety (PPA). Insomnia and poor sleep quality are frequently reported by postpartum women and are risk factors for postpartum mood disorders. This longitudinal study sought to assess whether perinatal insomnia or sleep quality predicted depression and anxiety across each month of the first 6 months postpartum in women with a history of depression.

Methods: Pregnant women ($N = 178$) aged 18-45 years with a self-reported prior history of depression were recruited from social media in late pregnancy. None of the women were depressed at enrollment. In late pregnancy and for up to six months postpartum, women completed monthly online questionnaires including the ISQ, PSQI,

EPDS, and GAD-7. Repeated-measures multilevel models were performed using the generalized linear mixed model command in the software IBM SPSS 28 to determine predictive associations across the postpartum. Demographics (age, education, race, and sex of baby) were statistically controlled for in these models.

Results: The rate of depression averaged (15.7%) and anxiety averaged (17.0%) across the postpartum. The prevalence of insomnia was 20.4%, and the prevalence of poor sleep quality was 67.8% across the first 6 months postpartum. Insomnia in the postpartum predicted greater depressive and anxiety symptoms, even after controlling for prenatal insomnia. Likewise, poor sleep quality in the postpartum predicted greater depressive and anxiety symptoms after controlling for prenatal poor sleep quality scores. When considering clinical cutoffs of the EPDS ≥ 12 and GAD ≥ 10 , postpartum insomnia and sleep quality uniquely predicted postpartum depression (OR = 5.69, 95% CI 3.33-9.74 and OR = 3.13, 95% CI 1.70 -5.77). Insomnia predicted postpartum anxiety (OR = 11.15, 95% CI 5.99-20.78), with sleep quality trending (OR = 1.76, 95% CI 0.99 -3.12). None of the demographic variables significantly contributed (P 's $> .05$).

Conclusion: Both postpartum insomnia and poor sleep quality contributed to clinical postpartum mood. The chronic sleep deprivation of insomnia and the subjective experience of poor sleep quality are uniquely relevant to risk for postpartum mood. The consideration and treatment of both is important as they are uniquely associated with adverse outcomes for mother and child.

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0628

RETINAL RESPONSIVITY INCREASES AFTER LIGHT THERAPY AND IS ASSOCIATED WITH IMPROVED DEPRESSION: PRELIMINARY FINDINGS FROM A RCT

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Introduction: Light therapy is a first line treatment for seasonal depression but is not effective for everyone. Understanding mechanisms of light therapy may help predict who will successfully respond to treatment. Individual differences in the retina's responsivity to light may underlie differences in treatment response given prior work linking reduced retinal responsivity in seasonal depression. This study tested if retinal responsivity changed across a light therapy intervention and whether changes in retinal responsivity were associated with improved depression.

Methods: Participants diagnosed with Major Depressive Disorder, With Seasonal Pattern were randomized to 6 weeks of light therapy or cognitive behavioral therapy for seasonal affective disorder (CBT-SAD). Participants in the light therapy group (N=52) were on average 41.9 years (SD=14.8) and predominantly women (72%). Retinal responsivity was assessed using the post-illumination pupil response (PIPR), measured mid-day in winter pre- and post-treatment. The net PIPR (red minus blue) was calculated as a percent of baseline 10-30 seconds post stimulus. Depression severity was measured using the Structured Interview Guide for the Hamilton

Depression Rating Scale – Seasonal Affective Disorder version (SIGH-SAD). Using multilevel models, we tested 1) if the PIPR changed from pre- to post-treatment and 2) if changes in the PIPR predicted improvements in depression. All analyses included a random intercept of participant ID and controlled for age, gender, time of testing, and the pupillary light reflex (PLR).

Results: There was a significant main effect of time on the PIPR, such that PIPR increased from pre- to post-light treatment ($b=0.29$; $SE=0.13$; $p=0.03$). There was a significant negative association between changes in PIPR and changes in depression, such that increases in PIPR were associated with decreases in depression symptom severity ($b=-0.18$; $SE=0.06$; $p=0.01$).

Conclusion: Retinal responsivity increased across a light therapy intervention and increases in retinal responsivity were associated with improved depression. It is possible an upregulation in retinal responsivity drives antidepressant effects of light therapy, either through direct or circadian pathways. However, changes in retinal responsivity measured throughout treatment are required to discern whether these changes are mechanistic.

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0629

CORRELATES OF SLEEP QUALITY AMONG INDIVIDUALS WITH CHRONIC PAIN AFTER MODERATE TO SEVERE TRAUMATIC BRAIN INJURY.

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Introduction: Sleep disturbance and chronic pain are very common after moderate to severe traumatic brain injury (msTBI). Despite having a bidirectional and mutually exacerbating relationship, there is a dearth of literature examining factors involved in the sleep-pain relationship following msTBI. Psychiatric symptoms (e.g., post-traumatic stress, depression) are also prevalent following injury and known to be related to sleep, as well as poor adjustment to chronic pain. The purpose of this study was to examine associations between sleep, psychiatric symptoms, and pain-beliefs among msTBI survivors who have comorbid chronic pain.

Methods: This is a secondary analysis of TBI Model Systems study data of 1,567 individuals reporting chronic pain after msTBI ($M=8.5$ years, $SD=7.1$). Participants were 46.8 years old on average ($SD=27.9$), predominantly male (72.7%) and completed measures of sleep (Pittsburgh Sleep Quality Index; PSQI), post-traumatic stress disorder (PTSD Checklist; PCL-5), depression (Patient Health Questionnaire; PHQ-9), anxiety (General Anxiety Disorder; GAD-7), pain-related catastrophizing (Coping Strategies Questionnaire; CSQ) and self-efficacy (Pain Self-Efficacy Questionnaire; PSEQ-2). Measures were adjusted for overlapping constructs. Relationships between sleep, psychiatric symptoms and pain beliefs were examined through Pearson correlations.

Results: Average PSQI total score for our sample was 8.78 (SD=4.4), indicating poor sleep quality, with an estimated 6.40 (SD=1.9) hours of sleep on average. Over two-third (68.5%) of our sample attributed some of their sleep disturbance to chronic pain and nearly half (47.4%) met cutoff (>8) for clinically significant poor sleep quality. PSQI scores were positively correlated with PCL ($r = .44$, $p < .0001$), PHQ-9 ($r = .12$, $p < .0001$), GAD-7 ($r = .08$, $p < .01$), CSQ ($r = .34$, $p < .0001$) and negatively correlated with PSEQ-2 ($r = -.023$, $p < .0001$).

Conclusion: Poorer sleep quality in individuals with chronic pain after msTBI is associated with more psychiatric symptoms, increased pain-related catastrophizing, and lower pain self-efficacy. Results highlight sleep quality as an important modifiable target for intervention in this at-risk clinical population and suggest that behavioral treatments to improve psychiatric comorbidities and adjustment to pain may be beneficial.

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0630

FOR WHOM THE BELL TOLLS: EMPIRICAL CLUSTERING OF INSOMNIA AND SUICIDAL IDEATION

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Introduction: Insomnia is associated with risk for suicidal thoughts and behaviors. It is unclear if insomnia drives risk equivalently across all individuals, or whether there are subgroups of high-risk individuals for whom insomnia is more relevant. This exploratory archival analysis examined the relationship between insomnia and current suicidal ideation among subgroups of individuals with lifetime suicidal ideation.

Methods: Data were acquired from the Military Suicide Research Consortium on 2,617 individuals without missingness on measures of suicidal thoughts and behaviors, anxiety, insomnia, thwarted belongingness, traumatic brain injury, risky alcohol use, and symptoms of post-traumatic stress. Medoid (k-means) clustering algorithms identified subgroups. Robust Poisson models tested interactions between insomnia and cluster identity in association with current suicidal ideation. Models were unadjusted, adjusted for demographic factors, and adjusted for clinical characteristics.

Results: Clustering identified two subgroups: Cluster 1 (N=1,141) and Cluster 2 (N=1,494). Cluster 1 had fewer individuals with current suicidal ideation (29.2% vs. 66.6%) and in general had less severe symptoms of anxiety, PTSD, insomnia, traumatic brain injury, and suicidal thoughts and behaviors. Across clusters, insomnia severity was associated with risk for current suicidal ideation (PRR: 1.09 [1.03-1.14]). Although individuals in Cluster 1 were less likely to have current suicidal ideation (PRR 0.51 [0.44-0.58]), greater severity of insomnia was associated with greater risk (PRR: 1.11 [1.04-1.18]). By contrast, individuals in

Cluster 2 had a greater risk of current suicidal ideation (PRR: 1.68 [1.51-1.88]) and greater severity of insomnia was associated with a diminished risk of current ideation (PRR 0.92 [0.88-0.97]).

Conclusion: In this exploratory study, individuals with less severe psychopathology were more likely to report current suicidal ideation with worsening insomnia, while those with severe psychopathology were less likely to report suicidal ideation with worsening insomnia. Insomnia may disproportionately increase suicide risk among lower risk individuals.

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0631

OVERNIGHT EMOTIONAL MEMORY IN INSOMNIA VERSUS GOOD SLEEPERS

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Introduction: "Sleep to forget and sleep to remember" model postulates that the content of emotional memory is strengthened during sleep while the arousal component is attenuated. Experimental sleep deprivation studies in healthy individuals have supported the model, but it is not known if sleep in individuals with insomnia, a condition of chronic poor sleep, provides the same effect on emotional memory.

Methods: Individuals reporting insomnia and good sleepers ($n = 76$ and $n = 83$ respectively; 83% female, mean age of 43.2 years) completed a picture-rating task to assess a) emotional valence ratings pre and post sleep and b) recognition accuracy post-sleep. In addition, an autobiographical memory task was completed during the day to assess a) the number of recalled memories in a 2-minute period for good and bad past events respectively, and b) emotional intensity ratings of the retrieved memories at the time the event occurred and how they feel now.

Results: Wilcoxon rank-sum test was used to assess group differences. Sleep diary variables on the experimental night showed that individuals with insomnia experienced a significantly more disrupted sleep than good sleepers (SOL: $r = 0.537$; WASO: $r = 0.620$; TST: $r = 0.669$). In the picture-rating task, there was no significant group difference for recognition accuracy (neutral stimuli: $r = 0.016$; negative stimuli: $r = 0.018$) or change in emotional valence pre-to-post sleep (neutral stimuli: $r = 0.003$; negative stimuli: $r = 0.008$). In the autobiographical memory task, individuals with insomnia remembered significantly fewer good days ($r = 0.245$) and rated their bad days at the time of its occurrence as significantly worse than good sleepers ($r = 0.235$). There was no significant group difference in the extent to which emotional intensity faded more for bad days than good days ($r = 0.113$).

Conclusion: We have shown that autobiographical memory is altered in insomnia which may have important influence on mental health. Our findings also suggest that overnight memory consolidation for negative stimuli is not affected in insomnia versus good sleepers. This may be a reflection of our one-night protocol; future work is needed across consecutive days.

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0632

THE RELATIONSHIP OF SHIFT WORK DISORDER WITH DEPRESSION, ANXIETY, AND STRESS

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Introduction: Shift work-related circadian misalignment can adversely impact health and well-being. Shift workers often experience disturbances in mood and impairments in waking vigilance and cognitive performance. Shift workers also commonly experience disturbed sleep. Shift work disorder (SWD) is a circadian rhythm sleep disorder characterized by insomnia symptoms during the sleep episode and sleepiness during the wake episode, temporally associated with shift schedules. Here, we examined the association between SWD and mental health.

Methods: Participants were adults (18 y+) who engaged in non-standard work shifts (morning, evening, night, rotating, other). Data were collected via online survey, and included questions about demographics, job details, sleep, and mental health. Participants completed the validated SWD Questionnaire, assessing the presence and severity of symptoms, categorizing individuals as high or low risk for SWD based on International Classification of Sleep Disorders criteria. Participants completed the Depression, Anxiety, and Stress Scale-21 (DASS-21). Higher scores on each DASS-21 subscale indicate higher symptom severity. Linear regression was used to determine the relationship between the presence of SWD and depression, anxiety, and stress symptom scores, adjusting for age, gender, shift work type, self-reported work-day sleep duration, and alcohol use frequency.

Results: Sixty participants were included (60% female, mean age: 37 [SD: 12.2] y). High risk for SWD was seen in 55% of participants. Sleep duration was on average ~40 minutes shorter in those with vs. without SWD (5.61 [1.24] h vs. 6.31 [1.31] h, $p=.037$). Participants with SWD reported significantly higher depressive symptoms than those without ($B=3.59$, $SE=1.52$, 95% CI [0.54, 6.65], $p=.022$). SWD was not associated with anxiety, and was marginally associated with stress ($B=2.48$, $SE=1.26$, 95% CI [-0.06, 5.02], $p=.055$). Age was significantly associated with lower stress symptoms ($B=-0.11$, $SE=0.05$, 95% CI [-0.22, -0.01], $p=.029$). No other covariates were significantly associated with depression, anxiety, or stress (all other $ps \geq .10$).

Conclusion: SWD was common. Its presence was associated with higher severity of depression symptoms. Intervention approaches targeting underlying causes of SWD (e.g., strategic

light-dark exposure and cognitive behavioral therapy for insomnia that is adapted for shift work) should be tested as methods to protect shift workers' mental health.

Support (if any):

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0633

AGE MATTERS: ASSOCIATION BETWEEN AGE AND DEPRESSION SEVERITY AT THE TIME OF OSA DIAGNOSIS, AND PAP ADHERENCE IN ADULT PATIENTS

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Introduction: Numerous studies have shown association and symptom overlaps between Obstructive Sleep Apnea (OSA) and depression. However, data is limited on association between age, severity of depression at time of OSA diagnosis, and its impact on PAP adherence. Patient Health Questionnaire-9 (PHQ-9) is a validated depression screening and severity scoring tool recommended by DSM-V. In this retrospective observational study, we will evaluate the interrelationship between age at OSA diagnosis, depression severity and positive airway pressure (PAP) adherence.

Methods: Patients were seen at the University of California, San Francisco Fresno sleep center. PHQ-9 scores for depression severity uses a 1-5 scale (1 = none, 2 = mild, 3 = moderate, 4 moderately severe, 5 = severe). PHQ-9 was administered at diagnosis of OSA and follow up, and average daily PAP usage was obtained from PAP devices after 1 month of therapy initiation. IBM SPSS version 29.0.0 was used to calculate descriptive statistics, Pearson correlation and Mann Whitney test.

Results: Twenty-six participants were included with mean age 53.04 years and standard deviation (SD) 17.97. PHQ-9 scores ranged 4-27 with mean 10.6, SD 5.9, 40% with mild and 66.3% with moderate to severe scores. 53.8% were 50 years or older ("older") while 46.2% were 49 years or younger ("younger"). Pearson correlation between average CPAP use and PHQ-9 scores was 0.181. Age did not affect PAP adherence (Pearson correlation -0.046). Moderate correlation was noted between age and PHQ-9 scores (-0.4390) with younger patients showing more severe depression scores. Comparison between "older" and "younger" patients showed significant difference in PHQ-9 scores ($p=0.020$).

Conclusion: This study showed that PHQ-9 scores at the time of OSA diagnosis are moderately correlated with younger age, with those patients younger than 50 years old having more moderate to severe PHQ-9 scores than patients 50 years or older. We did not find correlation between age and PAP adherence or between PHQ-9 scores and PAP adherence. Our findings can help identify depression early on in the diagnosis of obstructive sleep apnea and bring awareness that the young adult population can be particularly vulnerable.

Support (if any):

Abstract citation ID: zsad077.0634

0634**AN RCT OF BRIEF CBT FOR INSOMNIA AMONG PRIMARY CARE PATIENTS WITH SUICIDAL IDEATION**

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Introduction: There is an established association between insomnia and suicide. As with many conditions, the preponderance of patients with either insomnia or with suicidal ideation (SI) are seen in primary care settings. Brief forms of cognitive behavioral therapy for insomnia (bCBTi) have been delivered in primary care including to patients with mental health conditions. We sought to test the efficacy of bCBTi among primary care insomnia patients endorsing SI.

Methods: A sample of 194 participants endorsing SI and meeting criteria for insomnia disorder along with depression and/or posttraumatic stress disorder (PTSD) were randomly assigned to receive either four weekly sessions of bCBTi (n=98) or Sleep Hygiene (n=96). Participants engaged in suicide safety planning or a review of their existing safety plan. To be consistent with the primary care milieu, intervention sessions averaged < 30 minutes in duration with all intervention sessions audio-recorded and subjected to fidelity ratings. Outcome measures include the: Insomnia Severity Index (ISI; primary endpoint); Scale for Suicidal Ideation (SSI); Patient Health Questionnaire-Depression (PHQ-9); and PTSD Symptom Checklist-DSM 5 (PCL-5) administered at baseline and 6, 12, 18, 24, and 30-week follow-ups. Mixed effect analyses will test for linear change in each outcome over time, as well as examining intervention effects on these trajectories. The study also gathers initial data on barriers and facilitators to aid future implementation efforts.

Results: The study sample consists of 194 U.S. Military Veterans with a mean (sd) age of 51.5 (13.7) years, 23% of whom are female, 17% racial minorities and 9% ethnic minorities. Mean baseline values for the outcome measures are: ISI 19.1 (4.1); SSI 3.5 (5.3); PHQ-9 15.2 (5.1); and PCL-5 43.4 (14.3). Data collection will be completed in Spring 2023. In addition to complete enrollment and retention data, we will present results of analyses on primary (ISI) and secondary (SSI, PHQ-9, PCL-5) outcomes across all time points.

Conclusion: This randomized trial was designed to establish the feasibility and effectiveness of treating insomnia in primary care environments as a suicide prevention strategy while gathering data to facilitate implementation if the findings warrant.

Support (if any): U.S. Department of Veterans Affairs Office of Research & Development (101 HX002183)

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0635**ASSOCIATIONS BETWEEN AMBIENT LIGHT EXPOSURE AND DEVELOPMENT OF DEPRESSIVE SYMPTOMS IN WOMEN AT RISK FOR POSTPARTUM DEPRESSION**

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Introduction: There is increasing recognition that ambient light exposure plays a critical role in daytime functioning, including mood regulation. In this analysis, we examined associations between 24-hour light exposure patterns and mood in women at risk of developing postpartum depression.

Methods: Perinatal women ages 18-40 with a history of major depressive disorder or bipolar disorder who did not meet criteria for depression at study enrollment during 3rd trimester wore wrist actigraphs that recorded ambient light levels for one week at 3rd trimester (~33 weeks' gestation) and again during postpartum weeks 2, 6, and 16. Depressive symptoms were assessed with the Hamilton Depression Rating Scale (HAM-D-17) at the end of each recording week. To summarize the light data, we calculated the arithmetic mean of the log-light levels in twenty-four 60-minute bins across each day and then aggregated each hour across each recording week. We used nonlinear model fitting (cosinor) to calculate area under the curve (AUC) and compared 24-hour and morning (8:00 am to 12:00 pm) light exposure patterns between women with elevated depression symptoms at week 16 (HAM-D-17 > 7) and women with low depression symptoms at study entry and week 16 (HAM-D-17 ≤ 7) using Mann-Whitney U-tests.

Results: Compared with women who did not become depressed (n=15), those who ultimately developed depression (n=8) had significantly lower morning light exposure at 3rd trimester and at postpartum week 6, but not at postpartum week 16. Effect sizes were moderate at 3rd trimester (eta-squared=0.30) and small at Week 6 (eta squared=0.24). There were no significant differences in the overall 24-hour AUC of light exposure between participants who developed significant depressive symptoms at postpartum week 16 and non-depressed women at any time point [3rd trimester: p=0.35; postpartum week 6: p=0.92; postpartum week 16: p=0.35].

Conclusion: In this sample of perinatal women at risk for postpartum depression, new mothers who developed clinically-significant depressive symptoms at postpartum week 16 had lower levels of morning light exposure during 3rd trimester and at 6 weeks postpartum. Lower peripartum morning light exposure may predict the development of postpartum depression.

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0636

EXAMINATION OF LONGITUDINAL CHRONOTYPE STABILITY IN INDIVIDUALS WITH BIPOLAR DISORDER AND HEALTHY CONTROLS

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Introduction: Circadian rhythms have long been conceptualized as central to the pathophysiology of bipolar disorder (BD). Numerous cross-sectional analyses have demonstrated associations of eveningness with BD and greater severity of mood symptoms. Longitudinal studies that evaluate stability of chronotype and its association with mood symptoms are lacking.

Methods: 88 BD2) from the Prechter Longitudinal Study of BD. Participants completed an average of 10 years of longitudinal assessments of depression (PHQ-9) and mania (Altman Self-Reported Mania Scale) every 2 months, and chronotype (Munich ChronoType Questionnaire) annually. Chronotype was assessed using both a single item from the MCTQ in which seven possible chronotypes were presented (from extreme early to extreme late type), and the calculation of midpoint of sleep on work-free days, sleep-corrected (MSFsc). We calculated (in)stability using the mean square successive difference (MSSD) and assessed the relationship between mood, age, sex, medication, and stability using mixed effects models.

Results: Individuals with BD1 and BD2 reported later chronotypes compared to HC. Individuals with BD1 had later MSFsc as well as greater instability in chronotype and MSFsc compared to HC. Greater instability in chronotype was associated with higher depression and mania symptom severity. Treatment with mood stabilizers was associated with less instability in MSFsc, while antidepressant treatment was associated with greater instability in MSFsc.

Conclusion: Discussion: These results provide the strongest evidence to date of later chronotypes in individuals with BD. This is the largest examination of longitudinal stability of chronotype and results indicate that only BD1 is associated with greater instability over time. This instability, in part, reflects changes in mood symptoms over time, as well as in medication use. These data highlight the importance of assessment and treatment of circadian disruption in individuals BD.

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0637

ASSOCIATIONS BETWEEN SLEEP QUALITY AND CHILD BEHAVIORAL PROBLEMS, A LONGITUDINAL ANALYSIS

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Introduction: Internalizing and externalizing behaviors are important mental health outcomes in children. Internalizing symptoms are characterized by a disturbance in mood or

emotion. Symptoms include loneliness, sadness, anxiety, rumination, and depression. Externalizing symptoms are behaviors that are aversive to others and experienced by other people. Symptoms include aggression, hyperactivity, property destruction, and losing one's temper. This longitudinal analysis examined how children's sleep quality related to their internalizing and externalizing behaviors.

Methods: 246 Children (n = 246 at T1, n = 196 at T2, n = 151 at T3), with a mean age of 9.9 (SD = 1.4) at time one, participated in a longitudinal study on sleep and substance use. Sleep quality was measured with the Adolescent Sleep Wake Scale (range 1-6); higher scores represent better sleep quality. Child internalizing and externalizing behavior problems were measured using the Childhood Behavior Checklist; higher scores indicate higher levels of behavioral problems. The associations between sleep quality, and internalizing and externalizing behavior at T1, T2, and T3 were examined. One year separated each time-point. Data were analyzed by structural equation modeling. Latent variables of sleep quality, internalizing, and externalizing were created from the observed measurements at the three time-points. Latent variables of internalizing and externalizing were regressed on sleep quality.

Results: The model indicated an excellent fit with the data ($\chi^2 = 21.94$, $p = 0.46$; CFI = 1.00; TLI = 1.00; RMSEA = 0.00). All observed variables loaded significantly onto their respective latent variables, internalizing, externalizing, and sleep quality ($p < 0.001$). Results indicated that the latent variable of sleep quality predicted both the latent variables of internalizing ($b = -0.34$, $se = 0.09$, $p < 0.001$) and latent externalizing behaviors ($b = -0.31$, $se = 0.08$, $p < 0.001$).

Conclusion: These results indicate children with better sleep quality have fewer internalizing and externalizing behavioral problems. This suggests that improving sleep quality could improve behavioral problems in children. Alternatively, improving behavioral problems may improve sleep quality. Future research should examine the directionality of this relationship. Future research should also test if sleep or behavioral interventions improve sleep quality and child behavioral problems.

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0638

COMPARISON OF SOCIAL JET LAG BETWEEN INDIVIDUALS WITH SEASONAL AFFECTIVE DISORDER AND CONTROLS

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Introduction: Social jet lag (SJL) occurs when a person's social time (weekdays) is out of phase with their circadian time (weekend). Not much is known about the relationship between Seasonal Affective Disorder (SAD) and SJL; however, the sleep/wake cycle is very vulnerable to disruption by external factors. In a previous study in adolescents and young adults, self-reported chronotype was used to calculate SJL, and winter mood variation and SJL were found to be higher after the time change in fall and winter. Our study will directly compare SAD and non-depressed controls in the winter on SJL calculated with actigraphy in a sample of adults.

Methods: Participants (N=46) ages 21-64 were recruited during winter months and included individuals with SAD (n=21) and nonseasonal, never depressed controls (n=25). Midsleep timing was measured using actigraphy (average number nights = 7), and SJL was calculated by subtracting average week midsleep from average weekend midsleep corrected for number of days. Regression analysis included diagnostic group as a predictor, age and gender as covariates, and SJL as the outcome.

Results: While the seasonally depressed group had a slightly higher average SJL (M = 61.8 minutes, SD = 181.2 minutes) than the control group (M = 60.6 minutes, SD = 165 minutes; mean difference 1.2 minutes), there was no significant difference in SJL between the participants with seasonal depression and the controls ($p=0.778$). However, age was a significant predictor, as the younger half of the sample had a mean SJL of 94 minutes (SD=180 minutes) and the older half of the sample had a mean SJL of 24 minutes (SD= 156 minutes; mean difference= 70 minutes). There was no group*age interaction in post-hoc tests.

Conclusion: This is the first study to test whether individuals with SAD have greater SJL than non-depressed controls, and the data do not support such a hypothesis. Results do, however, confirm prior findings that SJL decreases with age. Future studies should compare SJL in individuals with SAD during winter compared to spontaneous summer remission to test whether a change in SJL correlates with winter depression onset.

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0639

DELAYED PRESENTATION OF SLEEP DISRUPTION AND DEPRESSIVE SYMPTOMS IN MALES POST MILD TRAUMATIC BRAIN INJURY (MTBI)

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Introduction: The relationship between sleep disruption and depressive symptoms is well established. Mild traumatic brain injury (mTBI) is commonly associated with emotional dysregulation and decreased sleep quality. Less is known about the course of mTBI and its association with mood symptoms over time. We hypothesized that those in acute stages of mTBI (2W; 1M) would significantly differ in sleep quality and depressive symptoms compared with healthy controls. As there are often sex differences in sleep and depression, we focused here exclusively on males with mTBI.

Methods: This study included 56 healthy males, split into six groups. The sample included 15 healthy males (Mage=23.67, SD=5.066) and 41 males (Mage=26.88, SD=8.509) with mTBI, at differing stages post-injury: 2 weeks and 1, 3, 6, and 12 months. Participants completed the Pittsburgh Sleep Quality Index (PSQI) and the Beck Depression Index (BDI-II) to assess sleep disturbance and mood, respectively. Higher scores on both measures indicate a more severe presentation of disruptive symptoms. We conducted a one-way ANOVA to examine how the mean score for both measures varied at each time point.

Results: Compared to healthy controls there was no significant variance in average depression scores at 2W, 1M, 6M, and 12M

($p>.05$). However, at 3M post-mTBI males reported significantly higher depression scores than healthy controls $M = 9.8$, $SD=9.48$, $p=.035$. Participants with mTBI reported greater sleep disruption when compared to healthy controls at 3M $M = 7.30$, $SD=3.16$, $p=.035$ and 12M $M = 7.0$, $SD=3.39$, $p=.037$, but not at other time points.

Conclusion: Contrary to our hypotheses, we found that males did not significantly vary from healthy controls for either measure in the acute stages of mTBI. These results indicate that males may not initially present depressive symptoms and sleep disruption post-mTBI, which could result in an inaccurate assessment of injury severity and an improper treatment plan moving forward in recovery. Further research conducted with a larger sample size would be useful in establishing that males suffering from mTBI experience the most severe presentation of symptoms roughly 3M after injury. Future work will need to examine whether these same trends are present among females.

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0640

DEPRESSION SYMPTOM OUTCOMES AFTER A SELF-GUIDED MOBILE APPLICATION CBT-I INTERVENTION AMONG COLLEGE STUDENTS

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Introduction: Previous research has shown that approximately 78% of college students who suffer from insomnia also endorsed depressive symptoms. Students with depression were 9.5 times more likely to have insomnia than students who did not have depression. There has also been evidence that Cognitive Behavioral Therapy for Insomnia (CBT-I) can reduce depression symptoms. However, the effectiveness of a self-guided mobile version of CBT-I (iCBT-I) in reducing depression among college students has yet to be evaluated. This study aims to assess depression symptoms among students who engaged in a self-guided iCBT-I intervention.

Methods: The study uses a between- and within-subjects design to assess biweekly changes in depression symptom severity before and after completing a four-week mobile intervention for insomnia (i.e., CBT-I Coach). Participants included 39 University of Arkansas college students with a baseline insomnia severity index score ≥ 15 . Participants were randomized into the intervention group or a wait-list control group. Participants in both groups are asked to use the CBT-I Coach app for 4 weeks (control group began intervention after a four-week delay). Every four weeks, the Center for Epidemiological Studies Depression Scale was administered to assess depressive symptomology.

Results: Preliminary analyses showed a reduction in CES-D mean scores between baseline ($M = 28.3$) and week four ($M = 25.4$) of the intervention group. The intervention group also experienced a depression score rebound at week eight ($M = 28.9$). The wait-list control group experienced little change in mean CES-D scores from pre-to-post intervention, baseline ($M = 23.4$), week four ($M = 24.2$), week eight ($M = 23.7$).

Conclusion: These results may lend evidence for the short-term effectiveness of iCBT-I in reducing depression symptoms. This could allow for wider dissemination of this treatment modality across a population who suffer from comorbid insomnia and depression.

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0641

DIFFICULTY MAINTAINING SLEEP AND SLEEP QUALITY MEDIATE THE RELATIONSHIP BETWEEN SLEEP DISTURBANCES AND DEPRESSION

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Introduction: Prior epidemiological research has established the relationship between sleep disturbances and depression. Sleep disturbances are also common prodromal features of and comorbid with depression. However, limitations exist across past studies, including the frequent focus on “sleep disturbances” over well-defined facets of sleep, inattention to mediators, and a lack of focus on special populations. As such, there is a need to delineate the relationship between sleep disturbances and depression across specific facets of sleep, particularly in special populations. The current study examined multiple sleep facets as mediators of the relationship between general sleep disturbances and depression severity in college student athletes.

Methods: Student athletes (N = 993) from the Pacific Athlete Conference-12 completed the Athlete Sleep Screening Questionnaire-Sleep Difficulty Subscale (ASSQ-SDS) and Patient Health Questionnaire-9 (PHQ-9). Parallel multiple mediator models were conducted to examine whether the relationship between sleep disturbances and depression severity was mediated by sleep duration, sleep quality, sleep onset latency, and difficulty maintaining sleep.

Results: Using bootstrapping with 5,000 resamples, the indirect effect of sleep disturbances on depression severity was significantly different from zero through sleep quality (indirect effect = .17, SE = .07, 95% CI [.04, .31]) and difficulty maintaining sleep (indirect effect = .12, SE = .03, 95% CI [.06, .19]). Sleep disturbances were associated with sleep quality (b = .29, SE = .01, p < .001) and difficulty maintaining sleep (b = .16, SE = .01, p < .001). Sleep quality (b = .59, SE = .16, p < .001) and difficulty maintaining sleep (b = .78, SE = .17, p < .001) were associated with depression severity. No other mediators reached statistical significance.

Conclusion: Results demonstrate that perceived sleep quality and difficulty maintaining sleep mediate the relationship between general sleep disturbances and depression severity in college student athletes. Findings suggest that sleep quality and difficulty maintaining sleep may be more impactful on depression than other facets of sleep and may be clinically useful targets of intervention for depression.

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0642

EFFECT OF ILOPERIDONE ON SLEEP SYMPTOMS IN BIPOLAR PATIENTS WITH MANIC AND MIXED EPISODES: A RANDOMIZED, PLACEBO CONTROLLED STUDY

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Introduction: Iloperidone, a dopamine D2 receptor and serotonin 5HT2A receptor antagonist, was evaluated for the treatment of acute manic and mixed episodes associated with bipolar I disorder in adults in a phase 3 clinical trial. A core symptom of bipolar I disorder is disturbance in sleep. During manic episodes this commonly presents as reduced need for sleep with studies finding that 69%–99% of bipolar individuals report a lessened need for sleep or difficulties in falling and/or staying asleep. Here we present a post hoc analysis evaluating iloperidone effects on the sleep component of the Young Mania Rating Scale (YMRS) in patients with bipolar I disorder which addresses both sleep and the reduced need for sleep in that component.

Methods: This was a multicenter, randomized, double-blind, placebo-controlled, parallel-group study of iloperidone in patients with acute manic or mixed episodes associated with bipolar I disorder. Patients received four weeks of double-blind treatment. The primary analysis demonstrating an overall improvement from baseline YMRS score in iloperidone assigned patients versus placebo assigned patients (p = 0.000008) at the end of the study (week 4). A YMRS item level analysis evaluated changes on YMRS single items including the sleep component in the intent-to-treat population (N = 392) using a mixed-effects model for repeated measures approach.

Results: The least squares mean difference (LSMD) in change from baseline to day 28 was statistically significant on the YMRS sleep component in favor of iloperidone versus placebo (iloperidone = -1.26, placebo = -0.95; p = 0.008).

Conclusion: In addition to improving overall mania symptoms as reported by the YMRS, improvements were also seen in iloperidone treated patients in the sleep component which at baseline included assessments of both decreased sleep and decreased need or denial of the need for sleep.

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0643

MACHINE LEARNING MODEL TO PREDICT DEPRESSIVE MOOD USING GRAPH THEORY ANALYSIS OF POLYSOMNOGRAPHY

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Introduction: The authors conducted this preliminary study to discover the brain signal features for subjective depressive mood by the method that combines a machine learning approach and a graph theory analysis.

Methods: The authors retrospectively investigated the records of 13 subjects who had undertaken polysomnography (PSG) and patient health questionnaire-9 (PHQ-9). We divided the data to a training set (10 subjects) and a test set (2 subjects). The predictive modeling was conducted by 3 steps: 1) estimation of the small world coefficient (sigma, omega) of each frequency bands (delta: 0.5-4.0 Hz, theta: 4.0-8.0 Hz, alpha: 8.0-12.0 Hz, sigma: 12.0-16.0 Hz, beta: 16.0-30.0 Hz, gamma: 30.0-100.0 Hz) of electroencephalography (EEG) channel for N1 and N2 sleep, 2) training predictive models, and 3) evaluation of final performance of model by using test set. The authors used mean absolute error (MAE) and mean squared error (MSE) as evaluation metrics. The training was conducted using Python 3.8, and its libraries (MNE-Python, MNE-connectivity, NetworkX, xgboost scikit-learn).

Results: Median value of PHQ-9 score was 6.0 (interquartile range: 5, 8). Lasso regression model showed good performance (MAE 0.6, MSE 0.4). XGBoost model also showed good performance (MAE 0.8, MSE 1.3).

Conclusion: Lasso regression model using small world coefficient of EEG in overnight PSG showed good predictive value for PHQ-9. The further research using a sufficient sample is needed.

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0644

POOR SLEEP QUALITY PREDICTS WORSE MOOD SYMPTOMS IN ADOLESCENTS WITH BIPOLAR DISORDER: A LONGITUDINAL RANDOMIZED CONTROLLED TRIAL

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Introduction: Adolescents with bipolar disorder are at ultra-high risk of suicide and poor psychosocial functioning. Sleep is impaired during periods of depression, mania, and euthymia in adults with bipolar disorder and may be a transdiagnostic risk factor for new onset of mood symptoms. Sleep worsens during adolescence, but less is known about the interrelationships between poor sleep and mood symptoms in adolescents with bipolar disorder.

Methods: Participants included adolescents with bipolar disorder (n=75, 12-18 years, 65 females) who consented to a randomized controlled trial of Dialectical Behavior Therapy (DBT) vs. Standard of Care (SOC; other evidence-based psychotherapy approaches) at a specialty psychiatric clinic. Participants completed seven assessment visits, five during the year-long treatment period (baseline, 3-months, 6-months, 9-months, 12-months) and two during the post-treatment follow-up (18-months, 24-months). During each visit, participants completed the Pittsburgh Sleep Quality Index (PSQI) and a semi-structured interview to obtain weekly clinician-rated mood symptom ratings for depression, hypomania, and suicidal ideation.

Results: Most participants (75.9%) had a PSQI score >5 at baseline, reflecting poor sleep quality (M=8.86, SD=4.30). Sleep quality improved between baseline and 3-months (Mdiff=-2.01, p=.006) and remained stable thereafter but did not differ between treatment groups. Lag analyses examined whether sleep quality predicted the next month's average mood symptom ratings. Across treatment group, sleep quality at 6-months predicted next month depression, hypomania, and suicidal ideation severity (ps<.032). For DBT, sleep quality at baseline predicted next month suicidal ideation severity (p=.047), and sleep quality at 9-months predicted next month hypomania severity (p=.003). For SOC, sleep quality at 6-months predicted next month depression severity (p=.027), and sleep quality at 9-months predicted next month suicidal ideation severity (p=.005). Worse sleep quality predicted worse future mood symptoms for all significant lagged effects.

Conclusion: Sleep quality is poor among adolescents with bipolar disorder. Sleep quality predicted future mood symptoms, suggesting that poor sleep may causally contribute to worse mood symptoms, particularly mid to late treatment. Thus, poor sleep could be a critical therapeutic target in future treatments to further improve mood symptoms in this population.

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0645

PREVALENCE OF SLEEP DISORDERS AND THEIR ASSOCIATION WITH POSTTRAUMATIC STRESS AND ANXIETY SYMPTOMS AMONG COLLEGE STUDENTS

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Introduction: Incidence of diagnosed psychiatric disorders tend to peak during early adulthood. Furthermore, sleep complaints are highly prevalent among college students, and often exacerbate psychiatric disorders. This study aimed to explore the prevalence of sleep disorders, and their association with posttraumatic stress disorder (PTSD) and generalized anxiety disorder (GAD) symptoms among college students.

Methods: College students completed self-report measures as part of a larger study (n=56; mean age 20.23 (SD=1.5); 83.9% females). The SLEEP-50 questionnaire estimated the prevalence of sleep disorders. Each sleep disorder required a cutoff score and at least one sleep complaint, with a minimum score of three or four used to classify a sleep complaint. The GAD-7 scale assessed for generalized anxiety disorder symptoms, and the PCL-5 determined PTSD symptomatology. Linear regression models identified the association between each sleep disorder on posttraumatic stress and generalized anxiety symptoms.

Results: Approximately 19.6% of students were at risk for at least one sleep disorder. The most frequent sleep disorder was hypersomnia (69.5%), followed by narcolepsy (53.6%), insomnia (48.2%), affective disorder (28.6%), and restless leg syndrome (21.4%). In contrast, circadian rhythm disorder (16.1%) and sleep apnea (7.1%) were infrequently reported. Linear regression models indicated that affective disorder (t=2.83, p<.007; t=3.13,

$p < .003$) and hypersomnia disorder ($t = 2.31$, $p = .025$; $t = 2.39$, $p = .020$) significantly predicted PTSD and GAD symptoms respectively. Additionally, insomnia ($t = 3.97$, $p < .001$) and restless leg syndrome ($t = 2.34$, $p = .023$) were significant predictors for GAD only, and circadian rhythm disorder ($t = 2.760$, $p = .008$) was a significant predictor for PTSD only.

Conclusion: Results suggest that risk of sleep disorders was significantly associated with PTSD and GAD symptoms in college students. Given these findings, health promotion programs are needed to promote good sleep hygiene and early interventions for mental health during college years.

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0646

PSYCHOLOGICAL DISTRESS AS PREDICTORS OF DISTURBED SLEEP AMONG COLLEGE STUDENTS

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Introduction: Poor sleep quality is prevalent among college students and has a significant impact on their daily activities. Further, college students are under extreme pressure to excel in an academic, occupational and social context, and psychological distress often exacerbate sleep quality. This study aimed to examine relationships between psychological stress and sleep quality among undergraduate students.

Methods: Baseline data were obtained from students who completed self-report measures as part of a larger study ($n = 56$; mean age 20.23 (1.5); 83.9% females). Poor sleepers were categorized when participants had at least 2 of the following indicators: excessive daytime sleepiness (Epworth Sleepiness Scale), insomnia symptoms (Insomnia Severity Index), and poor sleep quality (Pittsburgh Sleep Quality Index). The Beck Depression Inventory-II assessed depressive symptoms, the PCL-5 determined posttraumatic stress disorder (PTSD) symptomatology, and the Generalized Anxiety Disorder-7 (GAD) scale assessed for anxiety symptoms. Binary logistic regression analyses identified the association between poor sleepers, PTSD, GAD, and depressive symptoms, while adjusting for sex and body mass index (BMI).

Results: Approximately 33.9% of students experienced excessive daytime sleepiness, 30.4% suffered from insomnia, 89.3% had poor sleep quality, and 62.5% of the sample experienced one or more psychological stressors. Forty-eight percent of the students were categorized as poor sleepers. Using binary logistic regression, after adjusting for sex and BMI, students who experienced PTSD (OR = 1.075, 95%CI [1.023, 1.130]), GAD (OR = 1.227, 95%CI [1.072, 1.406]), and depressive (OR = 1.105, 95%CI [1.023, 1.192]) symptoms had an increased risk for being poor sleepers.

Conclusion: Findings indicate that mental health is a core component of well-being and sleep health, and that early assessment

and treatment of psychological distress may be an important strategy for intervention of poor sleep quality and disturbed sleep among college students.

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0647

REST-ACTIVITY PATTERN IN MAJOR DEPRESSIVE DISORDER - A CASE CONTROL STUDY

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Introduction: Disruption of rest-activity pattern are important behavioral manifestations in patients with major depressive disorder (MDD). Actigraphy provides accessible and objective measurement on physical activity, sleep, and circadian rhythm, but it was not widely used in studying patients with MDD, especially among Asian population.

Methods: Rest-activity pattern was recorded by Actiwatch Spectrum Plus/PRO for 7 continuous days. Physical activity and sleep estimation was processed by Philips Actiware software 6. Circadian rhythm characteristics were generated by using the “cosinor” and “nparACT” packages in R to perform the cosinor and nonparametric analysis respectively.

Results: A total of 70 MDD subjects, and 59 age- and sex-comparable controls were included in the actigraphy data analysis. The mean age of MDD subjects was 51.24 ± 10.39 years, and 71.4% of MDD subjects were female. Of these MDD subjects, 54.3% were unremitted for their depressive illness. For sleep and circadian features, MDD subjects had higher Insomnia Severity Index (ISI score, MDD: 10.29 ± 5.70 ; controls: 6.05 ± 5.20 , $P < 0.001$) and lower reduced Morningness-Eveningness questionnaire (rMEQ score, MDD: 13.19 ± 4.62 ; controls: 16.07 ± 3.28 , $P < 0.001$) than controls. The percentage of mobility measured by actigraphy was significantly lower in MDD patients than controls (MDD: 58.58%; controls: 62.27%, $P < 0.001$), albeit the difference only occurred during rest period. MDD subjects had later acrophase ($P = 0.024$), M10 midpoint ($P = 0.040$) and a trend of delayed sleep midpoint ($P = 0.076$) and longer sleep duration ($P = 0.067$) than controls. When the comparison was performed among three groups, unremitted MDD subjects showed a higher intra-individual variability of sleep midpoint than remitted MDD group ($P = 0.021$) and higher intra-individual variability for sleep duration than controls ($P = 0.016$).

Conclusion: MDD subjects had increased insomnia and eveningness than controls, which was supported by the actigraphy data at which MDD had a tendency of longer major rest interval and delayed circadian phase. Unremitted MDD subjects showed a higher intra-individual variability of sleep midpoint and sleep duration. These actigraphy parameters may be useful markers for phenotyping and monitoring of MDD.

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0648

RETINAL RESPONSIVITY IS ASSOCIATED WITH LIGHT AND SEASON-RELATED COGNITIONS IN OLDER ADULTS WITH SEASONAL DEPRESSIONAlison Klevens¹, Delainey Wescott², Maddison Taylor¹, Kathryn Roecklein¹¹ University of Pittsburgh, ² University of Pittsburgh - Pittsburgh campus

Introduction: Maladaptive cognitions associated with lower light availability in winter and the changing of the seasons are elevated in winter depression and are treatment targets in psychotherapy. Mechanisms underlying the development of SAD-specific cognitions may be related to seasonal variation in melanopsin-driven retinal responsivity to light. Prior work has shown reduced retinal responsivity to light during the winter in seasonal depression. We hypothesized maladaptive seasonal cognitions would be associated with reduced retinal responses to light. We also tested whether age moderated this relationship, hypothesizing that this learned association may only appear in older individuals who have experienced a greater number of seasonal depressive episodes.

Methods: Participants ages 19-65 ($M=36.13$, $SD=12.81$) with seasonal depression ($n=37$) and non-depressed controls ($n=32$) completed assessments in winter months (21st December to 21st March). Maladaptive seasonal cognitions were measured by the Seasonal Beliefs Questionnaire (SBQ). Melanopsin-driven retinal responsivity was assessed using the post illumination pupil response (PIPR). Net PIPR as a percent of baseline was averaged across the 10-30 seconds post-stimulus for use in analyses. Using multiple regression, we tested (1) if seasonal beliefs predict the PIPR and (2) if an interaction between seasonal beliefs and age predicts the PIPR, controlling for gender, the pupillary light reflex (PLR), and circadian time of testing from Dim Light Melatonin Onset.

Results: Seasonal beliefs were not associated with the PIPR ($b=-0.86e-5$, $SE=0.27e-3$, $p=0.98$). There was a significant interaction between seasonal beliefs and age on the PIPR ($b=-0.56e-4$, $SE=0.23e-4$, $p=0.02$), in which greater seasonal beliefs were associated with reduced PIPR in older individuals but not younger individuals. The Johnson-Neyman interval indicated that in participants above age 49, greater seasonal beliefs were significantly associated with lower retinal responsivity (PIPR; $p<0.05$).

Conclusion: Greater seasonal beliefs were associated with reduced retinal responsivity, but only in older adults with seasonal depression. It is possible that reduced retinal responsivity creates learned maladaptive schemas regarding seasonal changes that are reinforced with annually recurring winter depressive episodes. However, longitudinal data focused on changes in seasonal beliefs resulting from reduced retinal sensitivity is necessary to test whether retinal responsivity is a mechanism in the formation of these seasonal-specific cognitions.

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0649

SEX DIFFERENCES IN THE EFFECTS OF TMS ON DEPRESSIONShivani Desai¹, Lindsey Hildebrand¹, Melissa Reich-Fuhrer¹, Michael Grandner², William Killgore²¹ University of Arizona, ² University of Arizona College of Medicine

Introduction: As part of a larger study to examine the effects of repetitive transcranial magnetic stimulation (rTMS) over a single node of the default mode network (DMN) on sleep quality, we also examined secondary effects on depression. We hypothesized that rTMS would be more effective in females, rather than males, due to previously established higher rates of depression in the female population.

Methods: We administered continuous theta burst stimulation (cTBS) rTMS or sham stimulation, in a counterbalanced order separated by at least 5 days, over the left inferior parietal node of the DMN in 20 participants with clinical insomnia, 8 males ($Age=31.6$, $SD=6.7$) and 12 females ($Age=23.8$, $SD=4.3$). Beck Depression Inventory (BDI) scores obtained immediately before and after the stimulation sessions were compared using mixed (condition x time x sex) ANOVA to determine the effectiveness of rTMS in reducing symptoms of depression between the sexes.

Results: Overall, there was a large effect size ($\eta^2=0.207$, $p=0.077$) in BDI scores between scores after the sham cTBS TMS session ($M=12.47$, $SD=2.54$) and scores after the active cTBS TMS session ($M=10.00$, $SD=2.01$). However, when separating for sex, males did not show a statistically significant reduction in depressive symptoms for the active session compared to the sham session ($\eta^2=0.08$, $F(1,6)=19.00$, $p=0.508$). While the treatment did not significantly change depressive symptoms in females, large effect size was observed ($\eta^2=0.261$, $F(1,7)=18.06$, $p=0.16$), suggesting potential efficacy of the treatment. Post-hoc pairwise comparisons reveal a greater change in depression symptom scores for active vs sham cTBS TMS in women ($M=-4.00$, $SD=2.00$), than men ($M=-0.71$, $SD=1.43$).

Conclusion: An intervention using cTBS rTMS to improve sleep also led to a trend toward reduced depression, that was more evident among women. As reported elsewhere, this treatment significantly improved polysomnographic sleep, and the present preliminary results suggest that it may also be useful for modestly improving depressive mood, but further research will be necessary due to the limited sample size. It is not clear whether the trends toward mood among women was due simply to higher baseline depression scores in that group, but the findings suggest that additional work is warranted.

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0650**SLEEP AND MENTAL HEALTH SYMPTOMS AT THE POPULATION LEVEL: DIFFERENCES BY RACE/ETHNICITY**Sadia B. Ghani¹, Dora Valencia², Girardin Jean-Louis³, William D.S. Killgore¹, Michael Grandner⁴¹ University of Arizona, ² Sleep & Health Research Program, Clinical Translation Sciences, University of Arizona College of Medicine, ³ University of Miami, ⁴ Sleep & Health Research Program, Behavioral Sleep Medicine Clinic, University of Arizona College of Medicine

Introduction: There is a bidirectional relationship between sleep duration and mental health. This relationship may be impacted by race/ethnicity, indicating differential risk profiles across groups. Therefore, we aimed to determine whether race/ethnicity play a role in the relationship between sleep and mental health at the population level.

Methods: Data were used from adults age 18+ from the combined 2015-2020 (pre-pandemic) National Health and Nutrition Examination Survey (NHANES) (N=16,399). Habitual sleep duration was self-reported in half-hour increments and categorized as < 5h, 5.5-6.5h, 7-8h, 8.5-9.5h, or 10+h. Mental health symptoms in the past 2 weeks were reported as “not at all,” “several days,” “>half of days” or “nearly every day” and included depressed mood, anhedonia, feelings of guilt, appetite dysregulation, and suicide ideation. Race/ethnicity was self-reported as Non-Hispanic White (N=5499), Black/African-American (N=3975), Mexican-American (N=2337), Other Latinx (N=1846), Asian/Pacific-Islander (N=1984), or Multiracial/Other (N=758). Additional covariates included age and sex. NHANES sample weights were used for all analyses. Ordinal logistic regressions examined mental health outcomes associated with sleep duration stratified by race/ethnicity.

Results: Sleep duration by race/ethnicity interactions were seen for depression ($p=0.006$), guilt ($p=0.009$), appetite dysregulation ($p=0.049$), and suicide ideation ($p<0.0005$), with a trend for anhedonia ($p=0.185$). Non-Hispanic Whites demonstrated U-shaped relationships with all mental health variables. Blacks/African-Americans demonstrated U-shaped relationships for depressed mood and anhedonia and relationships with short sleep for guilt, appetite, and suicide ideation. Mexican Americans demonstrated a U-shaped association with guilt and an association between long sleep and depressed mood, anhedonia, and suicide ideation. Other Latinx showed a U-shaped association with guilt and appetite, and long sleep relationships with depressed mood, anhedonia, and suicide ideation. Asians/Pacific-Islanders showed short sleep associations with depressed mood and appetite. Multiracial/Others showed a short sleep relationship with guilt and a long sleep relationship with suicide ideation.

Conclusion: Both short and long sleep duration were associated with worse mental health. However, this pattern of relationships depends on race/ethnicity, as different groups show different patterns of vulnerability. Future work should explore mechanisms of differential vulnerability and develop targeted interventions based on risk profile.

Support (if any):

Abstract citation ID: zsad077.0651

0651**SLEEP REACTIVITY AS A VULNERABILITY FACTOR FOR DEPRESSIVE SYMPTOMS**Mara Egeler¹, Harrison Dickens¹, Veronica Hire¹, Jamie Walker¹, Ivan Vargas²¹ University of Arkansas, ² Department of Psychological Sciences, University of Arkansas

Introduction: Insomnia and depression are closely linked. While poor sleep is often classified as a symptom of depression, research now supports that insomnia often precedes and predicts the onset of depression. One factor that may explain this relationship is sleep reactivity, or the tendency to experience sleep disturbances in response to stressful life events. Sleep reactivity is considered a vulnerability factor for insomnia. This study aimed to replicate recent findings that suggest sleep reactivity is also independently related to depression.

Methods: Survey data was collected from 236 U.S. adults (69.1% White, 61.9.3% Female, 18-85 y) regarding demographic information, sleep patterns, and general health and well-being. Depressive symptoms were assessed using the Center for Epidemiological Studies Depression Scale (CESD). Insomnia symptoms were assessed using the Insomnia Severity Index (ISI). Sleep reactivity was assessed using the Ford Insomnia Response to Stress Test (FIRST). A hierarchical multiple regression was conducted with total CESD scores as the dependent variable. Total ISI scores and gender were entered as covariates in model 1 and total FIRST scores as the predictor variable in model 2.

Results: The fitted regression for model 1 was statistically significant ($R^2 = 0.37$, $F(2,233) = 64.47$, $p < .001$). It was found that both greater ISI and being female gender predicted depression scores ($\beta = 1.04$, $p < .001$, and $\beta = 1.64$, $p = .05$). For model 2, the regression was also significant ($R^2 = 0.38$, $F(3,232) = 47.60$, $p < .001$). Greater FIRST scores were related to greater depressive symptoms ($\beta = 0.23$, $p = .02$), even after controlling for both insomnia symptoms and gender.

Conclusion: Sleep reactivity is independently related to depression symptoms, independent of insomnia. Future studies examining how multiple types of stress reactivity impact an individual's risk for developing depression should be considered.

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Abstract citation ID: zsad077.0652

0652**SUBJECTIVE AND OBJECTIVE SLEEP DISTURBANCES IN INDIVIDUALS WITH PSYCHOTIC DISORDERS AND THEIR FIRST-DEGREE RELATIVES**Hazal Arpacı¹, Courtney Spitzer², Nicolas Raymond², Christine Talbot³, Erin Kohnke³, Robert Stickgold², Dara Manoach⁴, Matcheri Keshavan⁵, Bengi Baran¹¹ University of Iowa, ² Beth Israel Deaconess Medical Center, ³ Massachusetts General Hospital, ⁴ Harvard University, ⁵ Harvard Medical School

Introduction: Sleep disturbances commonly precede or precipitate psychotic disorders. The primary goals of the present study are to compare self-reports of sleep quality and chronotype with objective measurements and to investigate their relations with clinical symptoms and psychotic-like experiences (PLEs) in early course, minimally treated patients with psychotic disorders (PSY), their young, first-degree relatives (familial high risk: FHR) and matched controls.

Methods: Seventy-three participants (13-35 yrs, $n(\text{PSY})=19$, $n(\text{Controls})=30$, $n(\text{FHR})=24$) completed self-report measures of sleep quality (PSQI), chronotype (MEQ) and PLEs (Chapman Scales). Sleep quality and chronotype were objectively measured with actigraphy (average duration of measurements: 12 days). Psychosis and FHR groups were rated on the Positive and Negative Syndrome Scale (PANSS) by an expert clinician.

Results: PSQI was significantly different between the groups ($F(2,67)=11.8$, $p<.001$), this reflected that compared to controls, both the psychosis ($p<.001$) and FHR ($p=.002$) groups had worse self-reported sleep quality. For objective sleep quality, we observed a main effect of day-to-day variability in total sleep time ($F(2,46)=3.24$, $p=.048$), with significantly higher variability in PSY than controls ($p=.038$). Symptom severity in PSY and FHR correlated with PSQI ($r=.31$, $p=.047$), reflecting that those with higher psychotic symptoms had more sleep disturbances. PLEs in the entire sample also correlated with PSQI ($r=.41$, $p<.001$). We did not observe any correlations between objective sleep quality and symptoms. There were no group differences in chronotype (subjective or objective). Chronotype did not correlate with symptoms or PLEs.

Conclusion: While both early-course patients and their first-degree relatives report significant sleep disturbances, objective measurements corroborate this only for day-to-day variability in sleep duration in the patient group. Further, symptom severity and PLEs correlate only with subjective sleep disturbances. These findings highlight the importance of objective assessment of sleep quality in this population and are in line with our polysomnography work that reveals an isolated deficit in NREM sleep in the context of similar sleep duration and architecture in psychosis.

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0653

THE EFFECTS OF LIGHT EXPOSURE ON RETINAL RESPONSIVITY IN SEASONAL AFFECTIVE DISORDER

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Introduction: Seasonal affective disorder (SAD) is characterized as patterned depressed mood that emerges during the fall/winter and enters remission during the spring/summer. Retinal responsivity is lower in SAD in the winter and may contribute to the seasonal pattern of mood disruption (Roecklein et al., 2021). Light exposure in the month prior has been shown to influence retinal responsivity (Kawasaki et al., 2018). No work to date has investigated how more proximal prior light history may influence retinal responsivity differently in individuals with SAD versus

controls. This study sought to examine group differences in how environmental blue light exposure impacts retinal responsivity in the 2 hours prior.

Methods: Participants included 19 never depressed controls (Mean Age = 33, SD = 11), and 17 individuals diagnosed with SAD (Mean Age = 36, SD = 10). SAD episode criteria were assessed using the SCID-5 and SIGH-SAD. Retinal responsivity was measured using the Post-Illumination Pupil Response (PIPR) in the winter months. The PIPR was calculated as percent of baseline difference between the blue and red stimuli from 10-30 secs. Light exposure was measured using the Phillips Actiwatch blue light levels in photon flux in 30-second epochs for 2 hours before the PIPR. Means were calculated and cube transformed to account for right skew. Covariates included circadian time of PIPR testing, calculated from DLMO, and Pupil Light Reflex as a measure of retinal irradiance.

Results: Multiple regressions were performed for the SAD and control groups, separately. Results indicated that the mean blue-light exposure 2-hours before the PIPR did not significantly predict PIPR in either group (Control group: $b = -13e-7$, $p = 0.31$ / SAD group: $b = -12e-7$, $p = 0.13$).

Conclusion: This is the first study to find that light exposure within the prior 2 hours does not influence retinal responsivity in SAD or control participants. Future studies should evaluate different light exposure parameters, such as a longer duration of light exposure before the PIPR, variation in light exposure across different timeframes, and circadian time of light exposure.

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0654

TRAUMA LEADS ASSOCIATION BETWEEN SLEEP AND SUICIDAL IDEATION IN YOUTH

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Introduction: Sleep disturbances are established risk factors for youth suicidal ideation. Trauma is known to exacerbate sleep disturbances and suicide ideation severity. Given these relationships, it is worth examining the impact of trauma on the association between sleep and suicidal ideation as little research to date has explored this relationship in youth. The current study addresses this knowledge gap by investigating how trauma impacts youth suicidal ideation via sleep in an acutely suicidal, clinical sample of adolescents.

Methods: 113 adolescents between ages 12 and 17 years old ($M = 14.6$, $SD = 2.2$) were recruited after presenting to public New York City hospitals for suicidal ideation or a suicide attempt within the preceding 2 weeks. This clinical sample is diverse, with 76% identifying as a racial minority, 61% as a Hispanic/Latino, 87% as a gender minority, and 75% as a sexual minority. Participants completed self-report measures via an online questionnaire measuring their suicide ideation severity (Suicidal Ideation Questionnaire-Junior; SIQ-JR), sleep quality (Pittsburgh Sleep Quality Index; PSQI), and trauma

symptoms (Child Trauma Screen; CTS). Partial correlations were conducted to examine the relationship between sleep quality and suicide ideation severity controlling for trauma symptoms.

Results: As expected, poorer sleep quality was associated with greater suicide ideation severity ($r[103] = .244, p = .012$). However, this association disappeared when controlling for trauma symptoms ($r[102] = .064, p = .516$). Of the 7 PSQI sub-scores, sleep quality, sleep latency, and daytime dysfunction correlated significantly with suicide ideation severity ($r[103-110] = .195-.298, p = .001-.039$). Ninety-percent of participants reported trauma symptoms.

Conclusion: These findings suggest that trauma affects the association between sleep and suicidal ideation. However, given the prevalence of trauma symptoms in this sample, future research should seek to differentiate sleep and trauma effects on suicidal thoughts and behaviors and how specifically targeted treatments may ameliorate outcomes.

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0655

WHOSE MIND AFTER MIDNIGHT? DEMOGRAPHIC AND CLINICAL VARIATION IN NOCTURNAL SUICIDE RISK

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Introduction: Although suicides are more prevalent during the day, the risk of suicide is highest at night when adjusted for population wakefulness. It is unclear how nighttime patterns of suicide risk vary by demographic and clinical subgroups.

Methods: Population wakefulness data were combined with time of fatal injury data for 78,647 suicides from 2003-2017. The primary outcome was number of suicides per hour with wakefulness as an offset/exposure term. Subgroups included sex, race, ethnicity, military service, blood alcohol category and marijuana positive on autopsy, current depressed mood or partner conflict, and prior suicidal ideation or suicide attempts. Formal interaction tests identified significant subgroup variations adjusted for age, sex, race, and ethnicity where appropriate. Groups with significant interactions were subsequently examined using robust Poisson regression models to measure incident risk ratios (IRRs).

Results: There were subgroup interactions for age ($p < 0.001$), ethnicity ($p = 0.014$), blood alcohol level on autopsy ($p < 0.001$), and current partner conflict at time of fatal injury ($p < 0.001$). There was a sharp peak in risk around 4AM for individuals aged 15 to 24 (aIRR: 3.11 [2.39, 4.05]) and 25-34 (aIRR 2.15 [1.63, 2.86]), and at 6AM for individuals aged 65 to 74 (aIRR: 1.78 [1.40, 2.25]) and 75+ (aIRR: 2.25 [1.69, 3.00]). Hispanic individuals had an elevated risk between 10PM and 3AM with a maximal 232% increase at 2am (aIRR: 2.32 [1.67, 3.23]). Current partner conflict increased risk from 8PM to 11PM and from 1AM to 3AM with a peak risk at

11PM (aIRR: 1.53 [1.24, 1.89]). Individuals with a BAL < 0.08 mg/dL showed a sustained increased risk for suicide between 8PM and 4AM; individuals with a BAL of 0.08 mg/dL or more showed greater risk (aIRR 2.33 [1.88, 2.89] at 1AM) than those with a BAL < 0.08 mg/dL (aIRR: 1.68 [1.40, 2.01] at 12AM).

Conclusion: Nighttime suicide risk varied significantly by age, ethnicity, blood alcohol level on autopsy, and current partner conflict. Military service was not associated with greater nighttime risk, which contrasts with prior findings.

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0656

EVALUATING THE INTERRELATIONSHIP BETWEEN INSOMNIA, SLEEP APNEA AND NIGHTMARES IN VETERANS WITH POSTTRAUMATIC STRESS DISORDER

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Introduction: Observational research demonstrates a strong association between nightmares, insomnia, and sleep apnea in veterans with posttraumatic stress disorder (PTSD), supportive of the notion of a “complex sleep disturbance”. Relations between sleep disturbances and PTSD are often bi-directional and disturbed sleep affects non-sleep PTSD outcomes. We aimed to examine relationships between nightmares, respiratory events, CPAP use, and insomnia in trauma-exposed veterans with frequent nightmares.

Methods: Three weeks of app-based daily sleep diaries and weekly insomnia severity index (ISI) reports were collected from 41 veterans with a history of trauma and frequent nightmares. Relationships between weekly nightmares (total number), CPAP use, sleep efficiency, and ISI scores were analyzed using linear regression with standard errors adjusted for clustering of weeks within participants. Of the 41 participants, a subset of 15 participants completed 6-9 nights of at-home objective sleep measurements (Sleep Profiler) to examine the relationship between apnea events and nightmare awakenings. Measurements involved EEG integrated with airflow, respiratory effort, oxygen saturation, and actigraphy with event marker for real-time reporting of nightmares preceding awakenings.

Results: 41 veterans (mean age 48 (SD=16), 30% female) participated. Higher prior week ISI score predicted reduced CPAP adherence ($\beta = -.53, p = .005$). In turn, increased frequency and duration of CPAP use was associated with a significant increase in sleep efficiency the same week ($\beta = .53, p = .018$ and $\beta = .56, p = .026$, respectively). Analysis of respiratory events indicates that 20 of the 64 nightmare awakenings (31%) were preceded (i.e., within seconds of awakening) by apnea or hypopnea events. Of these 20, 11 events were reported by participants with a diagnosis of OSA and a CPAP device. Amongst these 11 events, 7

(64%) occurred on nights during which the participant reported use of their CPAP.

Conclusion: Analyses demonstrated statistically significant and clinically meaningful relationships among insomnia, nightmares, respiratory events and CPAP adherence in our sample, highlighting their interrelationships in trauma subjects. These data support the hypothesis that OSA contributes to nightmare experiences by demonstrating an immediate temporal relationship between apnea/hypopnea events and nightmare awakenings, and they underscore the importance of detecting and adequately treating sleep apnea for the treatment of nightmares in veterans.

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0657

INCIDENCE AND FEATURES OF NIGHTMARES AND TRAUMA ASSOCIATED SLEEP DISORDER IN U.S. MILITARY PERSONNEL WITH SLEEP DISTURBANCES

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Introduction: The incidence and clinical significance of nightmares is difficult to estimate due to varying criteria across studies. The Nightmare Disorder Index (NDI) is a validated measure to evaluate nightmare disorder. However, there is no measure to differentiate trauma-related nightmares compared to trauma associated sleep disorder (TSD), a unique REM parasomnia. The objectives of this study were to (1) determine the incidence of nightmare disorder and TSD in patients referred for a clinically indicated sleep evaluation, and (2) further characterize TSD.

Methods: All initial sleep referrals completed intake questionnaires including validated measures such as the NDI, Epworth Sleepiness Scale (ESS) and Insomnia Severity Index (ISI). Patients who endorsed at least weekly nightmares related to trauma, with vocalizations or disruptive nocturnal behaviors, and autonomic surges additionally received a structured clinical interview focusing on thematic content of dreams, dream enactment behavior, self-reported symptoms of autonomic hyperactivity, and, if previously treated, nightmare severity before and after therapy.

Results: 102 new patients completed the NDI and 56.9% (58) met criteria for probable nightmare disorder (ND). Of the 58 patients with probable ND, 13.8% (8) had symptoms consistent with TSD (7.8% of new referrals). Compared to ND patients, TSD patients were more likely to have higher ISI (24.0 ± 3.0 vs. 18.6 ± 5.6) ($p=0.023$) and total NDI score (15.8 ± 3.5 vs. 10.0 ± 3.7) ($p<0.001$), but not ESS ($p=0.158$). Structured interview revealed all TSD patients had significant daytime distress or impairment. The nature of trauma was combat for 3 individuals, physical assault for 1, and sexual assault for 4 (one occurring while deployed). All individuals reported tachycardia secondary to nightmares and tachypnea and diaphoresis were each reported in 75% of patients. Regarding dream content, 25% endorsed accurate replay of trauma, 25% related to trauma but non-replay, and 50% mixed. For DNB, 87.5% of patients endorsed

vocalization (moaning, screaming, or yelling), 87.5% endorsed movements (tossing, turning, or thrashing), and 37.5% endorsed combative behaviors (striking of bed partner).

Conclusion: This study reports a surprisingly high incidence of probable ND among all new sleep medicine patients. TSD appears to be a clinically distinct, more severe parasomnia compared to ND.

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0658

IS EVALUATING FOR DREAMS AND NIGHTMARES DURING CLINICALLY INDICATED POLYSOMNOGRAPHY USEFUL?

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Introduction: The incidence of nightmares and dreams during clinically indicated polysomnography (PSG) is rarely reported. We sought to (1) describe the incidence of nightmares and dreams during PSG, (2) PSG characteristics of nightmares and dreams, and (3) identify clinical correlates.

Methods: Ninety-three patients undergoing an initial clinically indicated PSG had a post-PSG and initial intake questionnaire reviewed. Questionnaires included Epworth Sleepiness Scale (ESS), Insomnia Severity Index (ISI) and Nightmare Disorder Index (NDI), as well as a structured post-PSG dreams and nightmares questionnaire. Dreams were self-reported, and a nightmare was differentiated from a bad dream if the former caused a patient-reported awakening.

Results: Overall, 87.1% were Active Duty and 89.2% reported the presence or absence of dreams. In total, 50.5% (47) reported no dreams, 22.6% (21) reported a dream, 2.2% (2) a bad dream, and 14% (13) a nightmare with 12/13 reporting details of their nightmare. The mean total NDI differed significantly between groups (6 ± 5 vs. 7 ± 6 vs. 12 ± 0 vs. 11 ± 5 , respectively) ($p=0.029$). The groups were not significantly different based on sex, age, BMI, diagnosis of depression, anxiety, PTSD, TBI, chronic pain, being prescribed a sleep aid or psychoactive medication, or their ESS and ISI values. PSG characteristics including REM percentage did not differ significantly between groups. Of those reporting a nightmare 75% (9) reported associated autonomic symptoms and 5 (41.7%) reported a trauma related nightmare (TRN). Of those with a TRN, one was related to combat, one sexual assault, two an accident, and one related to death. Two patients with TRN reported their nightmare was an accurate replay of the trauma, 2 reported a mix of replay/non-replay events, and one did not answer.

Conclusion: Despite rare reports of nightmare capture in sleep labs, our cohort uniquely demonstrated that at least half of first time PSG patients at a military sleep center experience a dream or nightmare during their PSG. Higher NDI scores may predict who is more likely to suffer from a bad dream or nightmare in the sleep lab. Assessing for the occurrence of dreams or nightmares during PSG is likely indicated.

Support (if any):

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0659

NIGHTMARES IN THE ACUTE AFTERMATH OF TRAUMA PREDICT LATER SUICIDAL IDEATION IN TRAUMA SURVIVORS

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Introduction: Nightmares are a common occurrence after experiencing a traumatic event and are a symptom of post-traumatic stress disorder (PTSD). Additionally, nightmares are associated with higher levels of suicidal ideation, attempt, and death from suicide. Nightmares may be an early sign of suicide risk in populations that have experienced trauma, however, there are no studies that have investigated this potential link. This study aims to determine whether more severe nightmares in the aftermath of trauma will prospectively predict later suicidal ideation, independent of comorbid insomnia.

Methods: We recruited adults that were admitted to the intensive care unit at Henry Ford Hospital in Detroit after experiencing a DSM-5 Criterion A traumatic event (N = 76, Mage = 38.39, 65.8% male). Participants completed study surveys at three time points: T1 (an average of 6 days after trauma), T2 (two weeks after T1), and T3 (1 month after T1). Nightmare and insomnia severity were measured at T2 with the Nightmare Disorder Index (NDI) and Insomnia Severity Index (ISI), respectively. Suicidal ideation was measured at T3 using item nine on the Patient Health Questionnaire (PHQ-9).

Results: More severe nightmares in the acute aftermath of trauma (T2) predicted more severe SI two weeks later at T3 ($\beta = 0.49$, SE = .17, $p = .004$, $R^2 = .22$). This association remained even after adjusting for T1 SI, T2 ISI, age, and sex ($\beta = 0.36$, SE = .18, $p = .044$, $R^2 = .31$).

Conclusion: More severe nightmares in the acute aftermath of trauma predicted more severe SI one month after trauma, independent of comorbid insomnia symptoms and baseline suicidal ideation. These findings suggest that the onset of nightmares immediately after trauma may confer a unique risk for SI. In clinical practice, it may be useful to detect nightmares in the aftermath of trauma using brief measures such as the NDI. Trauma survivors that develop frequent and severe nightmares within the acute recovery phase could then be given targeted nightmare treatment to reduce the risk of later SI.

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0660

IDENTIFYING PATIENTS AT RISK OF ACUTE SLEEP DISTURBANCES WITHIN THE IMMEDIATE AFTERMATH OF TRAUMA

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Introduction: Acute sleep disturbances are a common, modifiable consequence of trauma that, if left untreated, increase risk of PTSD by nearly two-fold. This suggests acute sleep disturbances after trauma are an important contributor to the etiology of

PTSD that could be targeted early to prevent the disorder. Yet, effective strategies to prevent PTSD cannot currently be implemented because we cannot identify who is most at risk of acute sleep disturbances after trauma, thus obstructing the ability to identify high-risk groups in need of early intervention. This study will test sleep reactivity – a trait predisposition to experience sleep disturbances after stress – as a predictor of post-traumatic sleep disturbances within one month following trauma exposure.

Methods: We recruited patients admitted to Henry Ford Hospital's intensive care unit in Detroit for traumatic injury (e.g., gunshot wound) (N = 88, M age = 39.53, SD = 14.31). While hospitalized, patients reported their pre-trauma sleep reactivity (Ford Insomnia Response to Stress Test; FIRST) and insomnia symptoms from the past two weeks (Insomnia Severity Index; ISI). Patients then completed the ISI again one month later (n = 48). We tested high sleep reactivity (FIRST > 21) as a prospective predictor of clinically significant posttraumatic sleep disturbances (ISI > 10).

Results: Patients were mostly black men (67%), and nearly half reported an annual income < \$20,000 (47.7%). Motor vehicle collisions were the most common trauma that precipitated patients' hospital admission (42%), followed by assaults with a weapon (30.7%). While adjusting for age and pre-trauma sleep disturbance, high sleep reactivity predicted increased odds of sleep disturbances one month after trauma ($b = 2.08$, SE = .98, $p = .033$, OR = 8.01, CI = 1.19 – 54.15).

Conclusion: Individuals with high sleep reactivity are at increased susceptibility of clinically significant sleep disturbances after trauma. The 9-item FIRST is a brief and clinically useful indicator that offers providers the ability to predict the onset of acute sleep disturbances after trauma, which are novel targets for early intervention. This might enable the early identification of potentially vulnerable individuals who might develop PTSD, toward whom sleep-focused preventive efforts can be targeted.

Support (if any):

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0661

NATURAL HISTORY OF NIGHTMARES FROM CHILDHOOD TO YOUNG ADULTHOOD: A LONGITUDINAL, POPULATION-BASED STUDY

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Introduction: Nightmares are common in childhood and typically become less prevalent in adulthood. However, little is known about the natural course of nightmares as children grow into adulthood. The purpose of this study was to examine the longitudinal trajectory of nightmares from childhood to adulthood to determine population-based remission, incidence, and persistence rates.

Methods: The Penn State Child Cohort is a random, population-based sample of 700 children (5-12 years at baseline) who returned for follow-up visits during adolescence and young adulthood. For the current study, 258 young adults (25.1 ± 2.7

years old, 53.9% female, 24.8% minority population) completed their follow-up visit (15.9 ± 2.0 years later). Nightmares were defined by parent-report in childhood and self-report in adulthood, based on severity. Rates of persistence, remission, and incidence for nightmares were computed.

Results: The persistence rate was 28% for mild childhood nightmares and 23% for moderate-to-severe childhood nightmares. About 13% of children with mild nightmares experienced a worsening into moderate-to-severe adult nightmares. The full remission rates was 58% and 32% for mild and moderate-to-severe childhood nightmares, respectively. About 45% of children with moderate-to-severe severe nightmares experienced partial remission into mild adult nightmares. Among children without nightmares, 32% and 8% developed mild and moderate-to-severe nightmares, respectively, in adulthood.

Conclusion: Moderate-to-severe nightmares only fully remit in about a third of children in by young adulthood. In addition, about one out of ten children with mild nightmares will worsen in severity by young adulthood. Furthermore, a significant number of children will newly-develop significant nightmares in young adulthood. Given the association of nightmares with adverse mental health outcomes, nightmares should become a focus of independent research and prevention practices.

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0662

DIGITAL SLEEP-HEALTH SURVEILLANCE: POPULATION NIGHTMARE FREQUENCY IS OBSERVABLE IN SOCIAL MEDIA

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Introduction: Nightmares are a critical component of multi-dimensional sleep health. Frequent nightmare recallers suffer reduced sleep length, depressed mood, and are more likely to be diagnosed with a psychiatric disorder in the future. Reliable population estimates of nightmare frequency are difficult to obtain and often restricted to rigid timepoints (e.g., once per year). Thus, there is a need for low-cost methods to track population levels of nightmare frequency and their dynamic changes over time. In the current study, we tracked dream content and nightmare frequency using a popular new approach – digital health surveillance – that analyzes language of public and freely-accessible social media posts to track population characteristics.

Methods: To evaluate whether social media could detect known changes in population sleep health, we extracted posts from r/Dreaming, a popular subreddit dedicated to dream sharing. Prior survey studies have shown a reliable increase in nightmare frequency during the first wave of the COVID-19 pandemic. Thus, we quantified the amount of nightmares posted on Reddit surrounding the World Health Organization's (WHO) declaration of a COVID-19 as a global pandemic. Nightmares were identified using a word-search algorithm that identified nightmare-related words in a post title. Nightmare frequency was compared before and after the WHO declaration using a chi-squared analysis.

Results: The percentage of dreams posted on Reddit that were identified as nightmares was higher after the WHO declaration than before ($p < .05$). Additionally, the amount of anxiety in

all dreams posted on Reddit was higher after the WHO declaration than before ($p < .05$). Weekly change in dream anxiety was positively correlated with the percentage of COVID-19 news headlines ($p < .05$).

Conclusion: We observed an increase in nightmares shared on Reddit immediately following the WHO's declaration of COVID-19 as a global pandemic. This novel approach to tracking nightmares might offer the field of sleep medicine a low-cost and real-time system for monitoring population sleep health. Other recent work suggests this method might be viable for tracking other components of sleep health.

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0663

RATES AND PREDICTORS OF RAPID EYE MOVEMENT SLEEP BEHAVIOR DISORDER SYMPTOMS IN POST-9/11 VETERANS

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Introduction: Post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI), both prevalent conditions in post-9/11 Veterans, have been linked to rapid eye movement sleep behavior disorder (RBD). We administered a validated screening instrument for RBD to post-9/11 Veterans enrolled in the Houston branch of the Translational Research Center for TBI and Stress Disorders (TRACTS) to investigate rates of RBD symptoms and clinical predictors of positive screens in this cohort.

Methods: In this cross-sectional analysis, the English translation of the Rapid Eye Movement Behavior Disorder Questionnaire - Hong Kong (RBDQ-HK) was administered with the standardized TRACTS battery. A systematic chart review was performed to assess for known sleep disorders. Fisher's exact and Wilcoxon rank-sum tests were used to compare categorical and continuous variables, respectively. Multivariable logistic regression was conducted, including as covariates the most significant clinical variables from univariable analyses. A p -value < 0.05 was considered statistically significant.

Results: Of the 119 subjects with available RBDQ-HK screens, 71 (59.66%) scored above the recommended total cut-off of ≥ 21 for psychiatric RBD. When positive screens were defined as a cut-off of ≥ 8 on Factor 2 of the RBDQ-HK, 65 of 119 (54.62%) subjects screened positive. Univariable analyses indicated that global sleep quality, number of TBI exposures, and current PTSD severity were most consistently associated with positive screens. Multivariable logistic regression analysis using a total cut-off score of ≥ 21 showed that PTSD severity (OR 1.06, 95% C.I. 1.02-1.10, $p=0.003$) and number of lifetime TBIs (OR 1.63, 95% CI 1.16-2.41, $p=0.01$) were independent predictors of positive screens, whereas global sleep quality was no longer significant (OR 1.10, CI 0.97-1.26, $p=0.149$). Multivariable logistic regression analyses were repeated using a cut-off score of ≥ 8 on Factor 2 and showed similar results.

Conclusion: Given the high positive screening rates for RBD in our cohort, future efforts are needed to validate RBD screening instruments; enhance interdisciplinary sleep assessments;

and investigate pathophysiological relationships between PTSD, TBI, and parasomnias.

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0664

ASSOCIATION OF NIGHTMARES WITH PREDISPOSING AND PERPETUATING FACTORS IN AN OUTPATIENT BEHAVIORAL SLEEP MEDICINE CLINIC

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Introduction: While nightmares are well known to be associated with greater sleep disturbance and psychopathology relative to insomnia, this has primarily been observed in experimental samples and not well-studied in outpatient clinical samples. Several theories for the etiology and maintenance of nightmares have identified the roles of both hyperarousal and emotion dysregulation in explaining the association of nightmares to adverse psychiatric outcomes. Given that insomnia is also associated with similar predisposing and perpetuating factors such as greater trait arousability and sleep reactivity, it is important to understand how these factors compare between nightmares and insomnia.

Methods: A total of 445 patients (45.6±18.4 years old, 66.5% female, 13.0% minority) with diagnoses of nightmare disorder (n=32), insomnia disorder (n=274) and any other sleep disorder (n=139) were evaluated at the Behavioral Sleep Medicine (BSM) program of Penn State Health Sleep Research & Treatment Center. To measure symptoms of depression, anxiety, stress, hyperarousal, sleep reactivity, and dysfunctional beliefs about sleep, all patients completed the Depression Anxiety Stress Scale (DASS), Arousal Predisposition Scale (APS), Ford Insomnia Response to Stress Test (FIRST), Pre-sleep Arousal Scale, and Dysfunctional Beliefs and Attitudes about Sleep (DBAS), respectively. Analysis of variance (ANOVA) examined between-group differences in patient-reported outcomes.

Results: There were no significant between-group differences on sleep reactivity, pre-sleep cognitive arousal, dysfunctional beliefs and attitudes about sleep or depression scores (all $p > 0.12$). However, patients with nightmare disorder showed greater arousability, in both trait anxiety and emotional reactivity, pre-sleep somatic symptoms, anxiety and perceived stress than patients with insomnia disorder or with any other sleep disorder (all $p < 0.05$).

Conclusion: While patients with nightmare disorder share predisposing and perpetuating factors common to patients with insomnia disorder, they do present with more severe forms of cognitive-emotional arousability, trait-anxiety, and somatic symptoms of anxiety that impact nighttime sleep. These data suggest that clinical evaluations for sleep disruption should include a thorough gathering of history to include the onset, course, and perpetuating factors. Cognitive-behavioral therapies for nightmares and insomnia should be tailored to target these specific factors in order to prevent relapses.

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0665

IBOGAINE TREATMENT IN COMBAT VETERANS SIGNIFICANTLY IMPROVES SLEEP, BEYOND ALLEVIATING POSTTRAUMATIC STRESS DISORDER SYMPTOMS

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Introduction: Ibogaine is an indole alkaloid traditionally used in spiritual and healing rites in some African cultures. Ibogaine is primarily studied in the context of substance dependence, but indications suggest it may enhance recovery from trauma. Here, we investigated the effects of ibogaine treatment for multisystem effects of exposure to repeated blasts and combat on self-reported sleep disturbance, insomnia severity, and trauma-related symptoms.

Methods: Participants were Special Operations Veterans who independently and voluntarily underwent ibogaine treatment at a specialized clinic outside the USA. After meeting rigorous screening requirements, 30 participants were enrolled, all endorsing histories of repeated combat and blast exposure and traumatic brain injury. Participants were seen in person for baseline, immediate post-treatment, and 1-month post-treatment assessments, including the Clinician-Administered Posttraumatic Stress Disorder (PTSD) Scale for DSM-5 (CAPS-5), the Pittsburgh Sleep Quality Index (PSQI), and the Pittsburgh Insomnia Rating Scale (PIRS). Twenty-six participants completed sleep measures at baseline and 1-month post-treatment.

Results: Two-tailed paired samples t-tests revealed significant effects of time, with post-treatment improvements in CAPS ($\Delta M = -26.8 \pm 11.1$, $t(25) = 12.283$, $p < .001$), PSQI ($\Delta M = -6.5 \pm 5.6$, $t(25) = 5.920$, $p < .001$), and PIRS ($\Delta M = -23.8 \pm 15.5$, $t(24) = 7.690$, $p < .001$). However, pre-post changes in PTSD symptom severity were not a significant predictor of improvements in PSQI ($R^2 = .229$, $b = .354$, $p = .074$) or PIRS ($R^2 = .232$, $b = .339$, $p = .090$) after controlling for age ($p = .206$ and $p = .165$, respectively).

Conclusion: To our knowledge, this is the first study examining the effects of ibogaine use on sleep in humans. Results indicated that while sleep and PTSD symptom severity improve 1-month post-treatment, they might be impacted by different mechanisms targeted by ibogaine. Even though a small sample size may have hindered the ability to reach desired probability values, the variance explained by the improvement in PTSD symptoms was still relatively modest (up to 23%). These promising findings demonstrate ibogaine's therapeutic potential for disturbed sleep in the context of traumatic brain injury and trauma. Potential explanations are discussed.

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0666

NEED A NOVEL METHOD TO REDUCE ANGER AFTER COMBAT? TREAT SLEEP APNEA.

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Introduction: Dysregulated anger can result in devastating health and interpersonal consequences for individuals, families,

and communities. Compared to civilians, combat veterans and service members (C-V/SM) report higher levels of anger and often have risk factors for anger including posttraumatic stress disorder (PTSD), traumatic brain injury (TBI), pain, alcohol use, and impaired sleep.

Methods: The current study examined the relative contributions of established variables associated with anger (e.g., combat exposure, current PTSD symptoms, history of TBI, pain interference, and hazardous alcohol use) in 1,263 C-V/SM. Sleep impairments, represented by poor sleep quality and obstructive sleep apnea (OSA) risk, were also evaluated as potential mediators of the relationships between established risk factors and anger, and therefore potential modifiable treatment targets.

Results: Multiple regression model results revealed that PTSD symptoms ($\beta = 0.517$, $p < .001$), OSA risk ($\beta = 0.057$, $p = .016$), pain interference ($\beta = 0.214$, $p < .001$), and hazardous alcohol use ($\beta = 0.054$, $p = .009$) were significantly associated with anger. Results of the mediation models revealed that OSA risk accounted for associations between PTSD and pain interference with anger.

Conclusion: Treating OSA may be a novel way to reduce anger in C-V/SM who have PTSD and/or pain interference. The current study extends previous literature by simultaneously examining factors associated with anger using a multivariable model in a large sample of C-V/SM.

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0667

A DIGITAL PRESCRIPTION THERAPEUTIC DEVICE TO TREAT NIGHTMARE DISORDERS: A CASE SERIES

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Introduction: Nightmare disorder and post-traumatic stress disorder (PTSD)-associated nightmares can be treatment-resistant in many patients. There are no recommended treatments for these conditions currently.

Methods: NightWare is a novel FDA-approved class II medical device which improves sleep in patients with nightmare disorder and PTSD-associated nightmares. It uses data from a smart watch to determine when nightmares are happening using heart rate and movement sensors, and then intervenes to interrupt the nightmare and improve overall sleep quality. We report the 14 consecutive cases of patients using NightWare and the Clinical Global Impression (CGI) of Severity and Change in their sleep and reduction of nightmare burden.

Results: Of the 14 patients in this series, 10 patients used the device for more than 7 days. 1 discontinued due to perceived lack of efficacy, 2 stopped in part due to a skin rash, and one stopped because he did not want to wear a watch to sleep. At

baseline, the 10 patients included in the analysis had a mean CGI Severity score of 4.7 (SD 1.25), which indicates moderate to severe nightmares and daytime dysfunction. Improvement in the CGI Change score with NightWare exceeded that of prazosin for this group of patients. The patients in this series that used the device had a mean score of 2.20 (SD 0.79) on the CGI Change scale, which indicates there was significant improvement from baseline. Six of the 10 patients using NightWare were also taking prazosin prior to starting NightWare. The prazosin dose ranged from 1-8 mg nightly for these patients. These 6 patients had minimal improvement with prazosin alone (CGIC of 3.16 (SD 0.41)).

Conclusion: In this case series, NightWare significantly improved the symptoms of nightmare disorder in 10 of the 14 patients in this series. Patient selection for sympathetic nervous system activation is important to ensure the device's effectiveness.

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0668

ADVERSE CHILDHOOD EXPERIENCES ASSOCIATED WITH ADULT INSOMNIA AND NIGHTMARES

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Introduction: Adverse childhood experiences can increase likelihood of hyperarousal, especially around periods of vulnerability. Survivors of trauma also experience more nightmares. These data explore whether adverse childhood events are associated with adult insomnia severity and nightmares.

Methods: Data were obtained from the Sleep and Healthy Activity, Diet, Environment, and Socialization (SHADES) study of N=1007 adults 22-60 years recruited from southeastern Pennsylvania. Adverse childhood experiences were defined as a self-reported history of child abuse, parent divorce, parent death, parent with depression, parent with anxiety disorder, and childhood poverty (yes/no). Insomnia severity was assessed using the Insomnia severity Index (ISI), evaluated both as a continuous variable and categorical: None (0-7) vs Mild (8-14) or Moderate-Severe (15+). Nightmares were assessed ordinally using the following anchors: Never, Seldom, Sometimes, Often, or Frequently. Covariates included age, sex, race/ethnicity, and education. Additional models included depression severity, assessed using a modified version of the Patient Health Questionnaire-9.

Results: Child abuse was associated with an additional 2.9 points on the ISI, and parental divorce, death, depression, and anxiety were associated with an additional 1.2, 1.7, 1.8, and 1.8 points, respectively (all $p < 0.005$). After adjustment for depressed mood, relationships remained for child abuse, parent divorce, and parent death. In evaluating categorical insomnia, child abuse was associated with both mild (RRR=2.64,

$p < 0.0005$) and moderate-severe ($RRR=3.37$, $p < 0.0005$) insomnia. Parent death was associated with an increased likelihood of moderate-severe insomnia ($RRR=1.94$, $p=0.007$). Parent divorce, depression, and anxiety were all associated with increased mild ($RRR=1.44$ [$p=0.03$], $RRR=1.85$ [$p=0.001$], and $RRR=1.85$ [$p=0.004$], respectively) and moderate-severe ($RRR=1.50$ [$p=0.03$], $RRR=2.24$ [$p < 0.0005$], and $RRR=2.40$ [$p < 0.0005$], respectively) insomnia. More frequent adult nightmares were reported by those who reported a history of child abuse ($oOR=1.9$, $p < 0.0005$), parent death ($oOR=1.6$, $p=0.007$), parent depression ($oOR=1.6$, $p < 0.0005$), and parent anxiety ($oOR=1.8$, $p < 0.0005$). After adjustment for depression, relationships with child abuse and parent death were maintained. Child poverty was not associated with insomnia or nightmares.

Conclusion: Adverse childhood events may contribute to later risk for insomnia and nightmares. Further efforts are needed to establish causality and develop interventions, which may have residual effects on mental and physical health.

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0669

DISRUPTIVE NOCTURNAL BEHAVIORS IN PTSD PATIENTS ARE ASSOCIATED WITH MORE SEVERE PSYCHIATRIC PATHOLOGY

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Introduction: The similarities and differences between trauma associated sleep disorder (TASD) and REM sleep behavior disorder (RBD) are unclear. However, both REM sleep parasomnias are associated with disruptive nocturnal behaviors (DNB) that manifest as episodes of sleep-related vocalizations, and/or complex motor behaviors. Patients who have more DNB are more likely to have a higher prevalence of PTSD.

Methods: In a cross-sectional study, we examined the relationship between DNB severity and the severity of psychiatric symptoms in PTSD patients. 73 civilian patients with histories of complex developmental trauma (age 47.0 ± 13.3 years; 89.6% female) met the DSM-5 criteria for moderate-to-severe PTSD. PTSD Checklist for DSM-5 (PCL-5) was used to obtain an index of current PTSD severity (37.41 ± 19.84 ; PCL-5 >30 cutoff for PTSD). DNB was defined as the sum of the two items 1f and 1g in the Pittsburgh Sleep Quality Index PTSD Addendum (PTSD-A). The participants rated how often during the past 1 month they had trouble sleeping because of the following: (PTSD-A Item 1f) "Had episodes of terror or screaming during sleep without fully awakening" and (PTSD-A Item 1g) "Had episodes of 'acting out' their dreams, such as kicking, punching, running or screaming". We used a stepwise multiple regression analysis with DNB as the dependent variable and the variables described below as independent variables.

Results: We determined the following relationships: 1. PCL-5 ($r=0.359$, $p=0.002$); 2. Brief Symptom Inventory which includes Somatization ($r=0.476$, $p < 0.001$); Obsessive-compulsiveness ($r=0.429$, $p < 0.001$); Interpersonal Sensitivity ($r=0.337$, $p=0.004$); Depression ($r=0.398$, $p < 0.001$); Anxiety ($r=0.449$, $p < 0.001$); Hostility ($r=0.577$, $p < 0.001$); Phobic Anxiety ($r=0.353$, $p=0.002$); Paranoid Ideation ($r=0.412$, $p < 0.001$); and Psychoticism

($r=0.414$, $p < 0.001$); 3. Insomnia Severity Index ($r=0.363$, $p=0.002$); 4. Beck Suicide Scale or BSS ($r=0.268$, $p=0.025$); 5. Beck Anxiety Inventory ($r=0.472$, $p < 0.001$); and 6. Fear of Sleep ($r=0.493$, $p < 0.001$). Fear of Sleep Inventory (FOS) (Beta=0.442, $t=4.258$, $p < 0.001$) and Beck Scale for Suicidal Ideation (BSS) (Beta=0.300, $t=2.887$, $p=0.005$) emerged as the significant predictors of DNB.

Conclusion: DNB was correlated with a wide range of psychiatric pathology in PTSD. This suggests that DNB could be an integral feature of severe PTSD. To our knowledge, this has not been previously reported.

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0670

EXAMINATION OF NEIGHBORHOOD DISADVANTAGE AND SLEEP IN A SAMPLE OF PTSD-DIAGNOSED VETERANS WITH TRAUMA NIGHTMARES

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Introduction: The nature of sleep can leave sleepers vulnerable to environmental threats, requiring a balance between the demands for vigilance and the physiological requirement for sleep. Understanding the sleeping context is particularly relevant to understanding the dynamics of sleep disturbance observed in individuals with posttraumatic stress symptoms (PTSS) because of subsequent increased vigilance to threats. This study examined the associations between neighborhood disadvantage, sleep respiratory sinus arrhythmia (RSA), fear of sleep, and nightmare frequency in a sample of trauma-exposed Veterans.

Methods: Baseline data from an ongoing study examining sleep with trauma nightmares using ambulatory sleep measurement in a sample of U.S. military Veterans were analyzed. Participants completed assessments of nightmare frequency and fear of sleep, and slept on a mattress actigraphy system for at least seven nights, which captured sleep-period RSA as an index of autonomic activation. Neighborhood disadvantage was assessed with the Area Deprivation Index (ADI), a census-based socioeconomic index. For this study, participants' zip codes were linked to 2020 ADI scores using the Neighborhood Atlas, and the census-block groups were ranked into state-level 1 to 10 deciles (split into halves- low and high). Higher ADI scores indicate greater disadvantage. The differences between the least and most disadvantaged groups were analyzed with binary logistic regression models.

Results: Data were available from 33 Veterans. The mean state-level ADI was 6.2 ($SD = 2.7$). Low and high state-level ADI scores were 4.3 ($SD = 2$, $n = 19$) and 8.7 ($SD = 0.8$, $n = 14$), respectively. Residing in zip codes with greater neighborhood disadvantage was associated with elevated fear of sleep ($OR = 1.2$, $p = 0.04$), and a trend for reduced sleep-period RSA ($OR = 0.4$, $p = 0.05$). No differences were observed for past week nightmare frequency.

Conclusion: In this sample of Veterans, living in the most disadvantaged neighborhoods was significantly associated with greater fear of sleep, and may be associated with reduced RSA.

Sleep context may increase hypervigilance in turn serving as a mechanism by which trauma-induced sleep disruptions are maintained.

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0671

IDENTIFYING DISRUPTIVE NOCTURNAL BEHAVIORS IN TRAUMA ASSOCIATED SLEEP DISORDER WITH VIDEO-POLYSOMNOGRAPHY ON CONSECUTIVE NIGHTS

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Introduction: Trauma associated sleep disorder (TSD) manifests with trauma-related nightmares, disruptive nocturnal behaviors (DNB), and autonomic hyperactivity. Although patients with TSD frequently report DNB, events are infrequently identified during in-lab polysomnography (PSG), possibly due to a sense of safety imparted by a monitored environment. It is unknown if patients with TSD acclimate to the lab environment if studied on consecutive nights. Given the infrequent and potentially subtle nature of DNB and REM sleep abnormalities, the objective of this study was to compare self-reported and PSG characteristics from two consecutive nights of PSG in patients with TSD.

Methods: Individuals were initially screened for TSD with the Pittsburgh Sleep Quality Index Addendum. Those reporting trauma-related nightmares and DNB underwent a structured clinical interview to confirm the diagnosis. Patients with TSD completed 2 consecutive nights of attended in-lab PSG with post-PSG dream/nightmare questionnaire. Video-PSG analysis was performed including detailed review of movements, excluding epochs with sleep disordered breathing. REM sleep analysis included quantifying “any” electromyographic (EMG) activity as an objective measurement for REM without atonia. ANOVA was used for statistical analysis.

Results: We diagnosed 15 individuals (11 males; 14 service members, 1 Veteran; average age 32.2 years) with TSD. Traumatic exposures were combat-related in 40% and physical or sexual assault related in 60%. There was a significant difference between proximal limb movements on night 1 vs night 2 (1.0 ± 1.73 vs 10.3 ± 4.04 ; $p=0.02$). There was a significant difference in the amount of increased EMG tone using 3 second REM mini epochs between the 2 nights (153 ± 147.8 mini epochs vs 417 ± 35.1 ; $p=0.04$). No difference was detected between nights for vocalizations or sleep parameters including total REM sleep time and percentage. Nightmares were reported by 33% during their first night PSG vs 66% during their second PSG.

Conclusion: In patients with TSD, there was an increase in the number of proximal limb movements, total mini epochs of “any” REM EMG activity, and nightmares during the second night of consecutive in-lab PSG testing. More than one night of in-lab PSG evaluation is likely required to best characterize the severe nocturnal disruptions of TSD.

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0672

NIGHTMARE DISORDER & INSOMNIA SEVERITY IN COMPLEX POSTTRAUMATIC STRESS DISORDER

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Introduction: Most adults experience a traumatic event at some point in their lifetime, and some also go on to develop posttraumatic stress disorder (PTSD). Sleep disorders such as insomnia and nightmares are common in PTSD, which may be due to hyperarousal and distressing memories that disrupt the sleep-wake cycle. Complex PTSD (C-PTSD) is a new distinct diagnosis of PTSD that includes three new symptom domains: emotional dysregulation, negative self-cognitions, and interpersonal hardships. Despite evidence linking PTSD and sleep disturbances, this work has yet to be extended to C-PTSD. To address this gap, the current study examined the association between nightmares, insomnia, and C-PTSD symptoms, as well as explored gender and the time elapsed since the traumatic event as moderating variables.

Methods: Data were obtained from a sample of 243 trauma-exposed participants recruited online. Most participants identified as White ($n = 207$; 85%), non-Hispanic ($n = 219$; 90%), and female ($n = 135$; 56%), with an average age of 37.26 years ($SD = 11.39$). The Complex Trauma Inventory (CTI) and International Trauma Questionnaire (ITQ) were utilized to measure C-PTSD symptoms.

Results: Greater C-PTSD symptoms measured via the CTI were associated with greater insomnia symptoms ($b = 3.22$, 95% CI [2.46, 3.97]) and nightmare disorder symptoms ($b = 2.14$, 95% CI [1.57, 2.72]). Similarly, greater C-PTSD symptoms measured via the ITQ were also associated with greater insomnia symptoms ($b = 0.28$, 95% CI [0.22, 0.34]) and nightmare disorder symptoms ($b = 0.18$, 95% CI [0.13, 0.23]). No moderating effects of gender or time elapsed since trauma were found.

Conclusion: Results underscore that C-PTSD symptoms are strongly linked to nightmares and problems falling asleep, staying asleep, and waking up too early—regardless of a person’s gender identity or how long ago they experienced a traumatic event. Findings may inform more targeted, sleep-focused cognitive-behavioral treatments for C-PTSD.

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0673

SLEEP IN PTSD: A SUBJECTIVE CONCERN

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Introduction: Sleep complaints are a hallmark of posttraumatic stress disorder (PTSD). Prior studies examining sleep abnormalities in PTSD are inconsistent, with some reporting objective sleep changes including associated obstructive sleep apnea (OSA), possibly due to moderating variables including advancing age, traumatic brain injury (TBI), and medications. We sought to compare sleep disorders and objective and subjective sleep metrics in service members with and without PTSD while controlling for these potential confounders.

Methods: Case-controlled observational cohort study performed at an academic military sleep center. Detailed sleep history, sleep-related questionnaires, trauma history, and video-polysomnography was performed. Patients with a history of TBI, abnormal neuroimaging, or psychoactive medication use (antidepressants, antipsychotics, anxiolytics) were excluded.

Results: Patients (N=169, 124 males) were active duty service members (median age 37.1 years) reporting a sleep complaint. Of these, 43 (25.4%) had PTSD vs 126 (74.6%) without PTSD. In patients with PTSD vs no PTSD, there was no significant difference in the rate of OSA, mean total sleep time, sleep efficiency, mean apnea-hypopnea index, sleep stage percentage, or any other polysomnogram (PSG) variable. Stage N3 sleep was non-significantly increased in patients with PTSD (18% vs 14%, $p=0.078$). Subjective sleepiness was similar between those with and without PTSD (Epworth Sleepiness Score 12.9 vs 11.9, $p=0.35$). However, subjective insomnia symptoms (Insomnia Severity Index 20.4 vs 15.2, $p<0.0001$) and perceived sleep quality (Pittsburgh Sleep Quality Index 15.4 vs 11.1, $p<0.0001$) were worse in those with PTSD vs no PTSD.

Conclusion: In a relatively young active duty cohort with no history of psychoactive medication use or TBI, patients with PTSD had more subjective sleep complaints than those without PTSD but objective sleep parameters, including PSG variables and OSA rate, did not differ significantly. The higher stage N3 (slow wave) sleep percentage, though not statistically significant, suggests that PTSD patients sleep better in a monitored sleep lab than in their habitual sleeping environment.

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0674

THE ROLE OF PTSD SYMPTOMS IN THE RELATIONSHIP BETWEEN SLEEP QUALITY AND PAIN FOLLOWING MODERATE-TO-SEVERE TRAUMATIC BRAIN INJURY

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Introduction: Poor sleep quality and chronic pain are common after moderate-to-severe traumatic brain injury (msTBI). Prior studies have not examined the role of PTSD symptoms in the relationship between sleep quality and chronic pain experience (i.e., severity and pain-related interference) in those with msTBI. Yet, PTSD is known to be associated with both sleep and pain. The purpose of this analysis is to determine the role of PTSD symptoms in the sleep-pain relationship among this at-risk clinical population.

Methods: Secondary analyses were performed on data (n=1537) from the TBI Model Systems follow-up study. Participants were an average age of 46.21 years old, predominantly male (72.61%),

and followed at an average of 8.5 years post injury. Participants completed measures of sleep quality (Pittsburgh Sleep Quality Index; PSQI), pain severity and interference (Brief Pain Inventory; BPI), depression (Patient Health Questionnaire-9; PHQ-9) and PTSD symptoms (PTSD Checklist, PCL-5). Analysis of covariance (ANCOVA) was used to examine differences in pain outcomes controlling for relevant covariates, adjusting for item redundancy prior to analyses.

Results: Sleep quality and pain interference are associated such that "good sleepers" (PSQI $\leq$ 8, mean=4.92 $\pm$ 2.17) have lower pain interference scores than "poor sleepers" (PSQI>8, mean=12.63 $\pm$ 2.87), with a mean pain interference of 3.41 $\pm$ 2.32 vs 5.26 $\pm$ 2.45 ($p<0.0001$). "Good sleepers" also had lower pain severity (4.22 $\pm$ 1.78 vs 5.28 $\pm$ 1.84, $p<0.0001$), lower PTSD symptoms (14.62 $\pm$ 13.46 vs 28.35 $\pm$ 17.82, $p<0.0001$), and less depression symptoms (5.32 $\pm$ 4.97 vs 10.57 $\pm$ 6.22, $p<0.0001$) when compared to "poor sleepers." Pain interference and severity were significantly related to all covariates at a $<.001$ level. Further, a significant effect of PSQI score cut-off ("good" v "poor sleeper") in both pain interference and severity remained after controlling for the effect of age, depression, and PTSD symptom scores.

Conclusion: In patients with msTBI, sleep quality and pain interference are positively associated such that better sleep quality corresponds with lower pain interference, a relationship which remains when controlling for PTSD and multiple covariates. Addressing the sleep needs of patients with msTBI through behavioral intervention (e.g., cognitive behavioral therapy for insomnia), even in the presence of additional psychiatric comorbidities, may assist those who experience chronic pain following injury.

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0675

LEVELS OF DEPRESSION DIFFERENTIALLY AFFECT SLEEP IN PEOPLE WHO HAVE HAD CANCER: FINDINGS FROM THE NATIONAL HEALTH INTERVIEW SURVEY

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Introduction: Cancer survivors experience an increased stress burden. Twenty-five percent (25%) of cancer survivors experience persistent depressive and anxiety symptoms and 40% are afflicted with chronic sleep problems. Analysis of this relationship between survivors' mental health and sleep may elucidate components of stress burden in a particularly vulnerable population. This study examined the relationship between anxious and depressive symptoms and frequency predicting sleep patterns, comparing individuals with a cancer history versus those without.

Methods: Data emanated from the 2020 National Health Interview Survey dataset (n=31,568). Six percent (n=1936) of respondents reported a cancer history. The primary outcome was sleep duration, based on the average hours of sleep per night an individual reported over the past month, which was coded into "healthy" (7-8 hrs.) vs "unhealthy" (< 7 hrs. or > 9 hrs.) sleep. Level of anxiety and depression as well as frequency of reported symptoms were included in the models as predictors.

Binary logistic regression models were performed to determine the discrete impact of depression and anxiety on sleep duration among individuals with and without a cancer history. Adjusted models included the demographic covariates of age, sex, education, household income, and race.

Results: In adjusted models, frequency of anxious feelings (OR = 1.19, $p < .01$), frequency of depressive feelings (OR = 1.29, $p < .01$), level of anxious feelings (OR = 1.38, $p < .01$), and level of depressive feelings (OR = 1.15, $p < .01$) significantly predicted unhealthy sleep in the full sample. However, among individuals with a cancer history, frequency of anxious feelings (OR = 1.16, $p < .01$), level of anxious feelings (OR = 1.28, $p < .01$) and frequency of depressive feelings (OR = 1.23, $p < .01$) significantly predicted unhealthy sleep duration, but level of depressive feelings did not (OR = 1.08, $p = .13$).

Conclusion: Mental health and sleep are closely and bidirectionally connected in the general population, but among individuals with a history of cancer the link between level of depression and healthy sleep were not significant. Further research is needed to understand the complex relationship between mental health and sleep among people with a cancer history.

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0676

SLEEP MEDICATION PRESCRIBING AMONG PATIENTS RECEIVING OPIOID USE DISORDER TREATMENT WITH COMORBID INSOMNIA

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Introduction: People initiating treatment for opioid use disorder (OUD) report insomnia to be a high priority, and insomnia is associated with compromised OUD treatment outcomes. However, insomnia treatments have yet to be investigated in the OUD clinical setting. Knowledge of prescribing patterns for sleep medications among OUD treatment patients is an essential first step to advance therapeutic development at the insomnia-OUD comorbidity. This retrospective cohort study used administrative claims data from IBM MarketScan Commercial and Multi-State Medicaid databases (2006-2016) to investigate the prevalence of insomnia medication prescriptions among patients in OUD treatment with buprenorphine. In doing so, we assess sex differences in prescription receipt within this unique patient population, given the known sex-based disparities in insomnia among other adult populations.

Methods: We included people aged 12-64 years with diagnoses of insomnia and OUD initiating buprenorphine during the study timeframe. The primary outcome was receipt of insomnia medication prescription within 60 days of buprenorphine start, encompassing benzodiazepines, Z-drugs, or non-sedative/hypnotic insomnia medications (e.g., hydroxyzine, trazodone, and mirtazapine). Descriptive analyses present prescription prevalence for the total sample as well as separately for males and females. Lastly, associations between sex and insomnia medication prescription receipt were estimated using Poisson regression models.

Results: Our sample included 9,510 individuals (female $n=4,637$; male $n=4,873$) initiating buprenorphine for OUD who also had insomnia, of whom 6,569 (69.1%) received benzodiazepines, 3,891 (40.9%) Z-drugs, and 8,441 (88.8%) non-sedative/hypnotic medications. Poisson regression models, adjusting for sex differences in psychiatric comorbidities, found female sex to be associated with a slightly increased likelihood of prescription receipt: benzodiazepines (risk ratio [RR], RR=1.17 [1.11-1.23]), Z-drugs (RR=1.26 [1.18-1.34]), and non-sedative/hypnotic insomnia medication (RR=1.07, [1.02-1.12]).

Conclusion: Sleep medications are commonly being prescribed to individuals with insomnia in OUD treatment, especially females. These findings juxtapose the known increased overdose risk with benzodiazepine use and lack of efficacy data for these pharmacologic insomnia treatments in this growing patient population in the opioid crisis.

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0677

BLUNTED DAILY LIGHT RHYTHM AMPLITUDE IN ADULTS WITH OPIOID USE DISORDER (OUD)

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Introduction: Accumulating evidence implicates sleep and circadian rhythm disruption in substance use disorders, including opioid use disorder (OUD). Blunted amplitude in daily rhythms of circadian-relevant variables (e.g., activity, light) may be a marker of psychopathology, as depressed adults demonstrate a smaller activity amplitude compared with healthy controls. The present study compared the light and activity amplitudes of adults with OUD with healthy controls.

Methods: Light and activity data were collected from adults with OUD who were recently stabilized on medication-assisted treatment ($N=27$; $\text{Mage}=44.25 \pm 13.21$). Participants wore an Actiwatch for an average of 14.5 ($\text{SD}=4.14$) days. Light and activity data collected from healthy adults ($N=15$; $\text{Mage}=22.88 \pm 2.76$) who wore an Actiwatch an average of 11.59 ($\text{SD}=1.07$) days in a separate study were included as a comparison group. Light and activity amplitudes for each day and a composite amplitude for the sampling period were calculated using non-orthogonal spectral analysis.

Results: Results of mixed model ANOVA with subject as a random factor and group and day as fixed factors revealed a significant main effect of group on daily light amplitude ($p < .01$), such that the OUD group exhibited lower daily light amplitudes compared to healthy controls, and a trend-level main effect of group on daily activity amplitude ($p = .09$), such that the OUD group exhibited lower daily activity amplitudes

compared to healthy controls. With age included as a covariate in the model, the main effect of group on light remained significant, whereas the trend-level effect on activity became non-significant. Results of between-subjects t-tests indicated significantly lower composite light and activity amplitudes during the entire sampling period in the OUD group compared to healthy controls ($p < .05$).

Conclusion: These findings indicate that OUD is characterized by blunted light amplitude, which could both reflect and contribute to disruptions in circadian physiology in OUD. Light amplitude may be a novel target for behavioral OUD interventions. Future research is needed to determine whether blunted light amplitude is associated with OUD treatment outcomes and to further examine activity amplitude in OUD with larger sample sizes.

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0678

CONSEQUENCES OF FOLLOWING THE HERD: PERCEPTIONS DRIVE A VICIOUS CYCLE OF POOR STUDENT SLEEP HABITS AT AN ELITE UNIVERSITY

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Introduction: Poor sleep health is widespread among undergraduate university students. This study sought to understand the contributors to poor sleep quality at an elite undergraduate university in the United States. In particular, we were interested in uncovering the social influences on sleep regularity, which is increasingly regarded as a critical determinant of overall sleep quality.

Methods: An exploratory, mixed-methods study was designed combining a week-long diary study ($n=5$) and in-depth contextual interviews ($n=5$) to better understand undergraduate students' college experience and sleep behaviors, followed by a student survey ($n=181$) to uncover primary macro trends and factors related to those sleep behaviors.

Results: A significant irregular sleep schedule emerged as highly common among students. Sleep irregularity was strongly influenced by students' perceptions about their peers' sleep and working habits. These perceptions combined with a personal desire to keep pace with their peers and the prioritization of academic work implicitly stated by the university culture influenced when and how students went about their lives, even if those behaviors meant acting against their knowledge and judgment. The convergence of perceptions and behaviors generates a vicious cycle of sleep deprivation and low productivity. The cycle stems from students' desire to match their peers, which leads to late nights and sleep deprivation. The resulting impaired executive functioning contributes to subsequent inefficient scheduling and lack of concentration. As concentration drops, students multi-tasked more often and incomplete tasks piled up, necessitating further sleep deprivation to get it all done.

Conclusion: Poor sleep regularity in college is influenced by a set of interconnected factors derived at both the level of the individual student and at the student-body level. Interventions should consider a dual approach to break the vicious cycle, targeting

the harmful beliefs among students about the sleep and working habits of their peers, and the prioritization of academic work.

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0679

DO INDIVIDUALS WITH ADHD AND SLEEP DISORDERS SYMPTOMS EXHIBIT WORSE EXECUTIVE FUNCTION?

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Introduction: Sleep disorders in individuals with Attention Deficit Hyperactivity Disorder (ADHD) are more prevalent than in people without ADHD. Given that sleep disorders (e.g., insomnia and OSA) impact daytime function (e.g., mood, memory, motivation, attention, executive function [EF], etc.), it is reasonable to wonder if these domains interact. Thus, the aim of the present analysis was to evaluate subjects diagnosed with ADHD who were also symptomatic for insomnia or OSA on a self-report measure of executive function. The hypothesis for the analysis being: subjects with insomnia would show more severe executive function deficits as compared to subjects without symptoms of insomnia and/or subjects with OSA.

Methods: This analysis includes data from 149 subjects diagnosed with ADHD (38% female, $\text{Age } 32.8 \pm 13.2$ yrs). Sleep disorder and EF data was provided by the Penn ADHD Treatment and Research Program. Database assessments were gathered from intakes, which included the SDS-CL-25 (a comprehensive screener for sleep disorders) and the BDEFS-LF (a self-report measure of EF deficit). In order to type individuals as "symptom positive" for insomnia or OSA, subjects were required to score >3 for any item within each category. These groups were then compared for their scores on the BDEFS-LF (total score and for three factor scores: self-restraint score [BDEFS-SR], self-regulation of emotions score [BDEFS-SRM], and self-motivation score [BDEFS-SM]).

Results: Subjects with-and-without insomnia symptoms were not found to significantly differ on the BDEFS-T, or any of the three sub-scales. In contrast, subjects with-and-without OSA symptoms significantly differed on the BDEFS-T ($p=0.0328$), and on two of the three sub-scales (BDEFS-SR [$p=0.0183$] & BDEFS-SRM [$p=0.0032$]).

Conclusion: Contrary to our hypothesis, it was the symptom positive OSA group that showed the most deficits on executive function (as measured by the BDEFS-T). This suggests that, in people with ADHD, sleep fragmentation and/or hypoxia may be more associated with EF deficits than problems with sleep initiation or maintenance. This said, it is also possible that other measures of insomnia that better represent sleep insufficiency and/or total nocturnal wakefulness may be more associated with

executive functioning deficits, alone or in combination with the sleep sequela of OSA.

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0680

DOES IMPULSIVITY MEDIATE THE ASSOCIATION BETWEEN SLEEP DISTURBANCE AND BINGE EATING?

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Introduction: It has been suggested that sleep continuity disturbance and/or short sleep duration is associated with increased impulsivity across clinical populations (i.e., The Mind After Midnight Theory). Consistent with this theory are the findings showing that sleep disturbance is associated with increased binge eating (BE; a subjective sense of loss of control over one's eating) both cross-sectionally and longitudinally. To date, no study has examined whether impulsivity mediates the association between sleep disturbance and BE. Further, the extant literature has relied on retrospective self-report assessment of impulsivity which is subject to recall and social desirability biases. The aim of the present study was to examine whether performance on a behavioral measure of impulsivity (Go/No-Go task) mediated the association between sleep quality (SQ), sleep efficiency (SE%), and daytime dysfunction (DD), as measured by the PSQI, and BE frequency.

Methods: The parent study was a sample of 63 individuals (85.9% female; Xage=40.6 years) seeking treatment for BE. Of note, individuals with extremely low levels of impulsivity were excluded from the parent study. Mediation models using the lavaan package in R (version 4.1.3) examined the effect of sleep disturbance on impulsivity and whether DD mediated this association. The current analyses included the full available sample and all models co-varied for depressive symptoms.

Results: A negative direct effect of DD on impulsivity was observed ($B=-55.43$, $S.E.=22.06$, $p=.01$) and impulsivity did not significantly mediate the association between SQ ($B=0.20$, $S.E.=0.59$, $p=0.73$), SE ($B=-0.02$, $S.E.=0.14$, $p=0.92$), or DD ($B=0.160$, $S.E.=1.14$, $p=0.51$) and BE frequency.

Conclusion: While impulsivity did not mediate the association between sleep disturbance and BE in our sample, the current study may have been under-powered to detect even large effects due to its moderate sample size and low levels of insomnia symptoms. Future studies should evaluate these associations in large samples, using prospective measures of sleep continuity and do so in samples with clinical levels of insomnia. Further, such studies should take into account time of day considerations.

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0681

THE RELATIONSHIP BETWEEN SAFETY BEHAVIORS AND INSOMNIA IN INDIVIDUALS WITH POST-TRAUMATIC STRESS DISORDER

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Introduction: Safety behaviors may perpetuate anxiety, maintain an individual's perception of threats, and may lead to psychosocial impairment. Safety behaviors are commonly seen in those suffering from insomnia and post-traumatic stress disorder (PTSD). Despite their prevalence and associated impairments, there exists no data on the relationship between insomnia and safety behavior in those suffering from PTSD. The aim of this study is to evaluate the relationship between safety behavior and insomnia in those with PTSD. If such a relationship is seen, does the severity of nightmares or overall PTSD mediate this relationship between insomnia and safety behaviors?

Methods: The study extracted data from baseline assessments of a treatment study conducted at the VA Medical Center at Philadelphia. The subjects were treatment-seeking patients with PTSD ($N=43$). Safety behavior was evaluated using the 12-item brief Safety Behavior Assessment Form (SBAF), PTSD was evaluated using the PTSD checklist for DSM-5 (PCL-5), and insomnia with Insomnia Severity Index (ISI) scales. Bivariate analyses evaluated the relationship between SBAF total score and age, education, income, PCL-5, and ISI total scores. Nightmare severity was evaluated using item number 2 from the PCL-5 questionnaire. An analysis evaluated the role of the severity of nightmares or PTSD (PCL-5 total score after excluding the sleep and safety items) as independent mediators in the relationship between SBAF and ISI total scores.

Results: The mean $\pm$ standard deviation of their age was 56.1 ± 11.6 years and 13.1 ± 2.1 years of education. They were mostly males (86.0%), black (61.9%) and unemployed over the past month (76.8%). The mean total score was 17.1 ± 5.7 on the SBAF, 17.3 ± 7.4 on the ISI, and 52.5 ± 14.5 on the PCL-5. Bivariate analysis demonstrated that SBAF total score was associated with the ISI ($\beta=0.32$, $p=0.0005$ and PCL-5 ($\beta=0.22$, $p=0.0004$) total scores. Mediation analysis demonstrated a significant mediation effect of nightmares ($R^2=24.6\%$) and PTSD severity ($R^2=33.3\%$) on the association between safety behaviors and insomnia.

Conclusion: About sixty percent of the variance in safety behaviors was explained by insomnia and its association with PTSD or nightmare severity. Treatment of underlying insomnia, PTSD, or nightmares may improve the safety behaviors associated with PTSD.

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0682

ADAPTING A TRANSDIAGNOSTIC SLEEP INTERVENTION FOR YOUNG ADULTS WITH AUTISM SPECTRUM DISORDER: PRELIMINARY DATA*Kristina Lenker¹, Anna Cozzi¹, Michael Murray¹, Allison Harvey², Susan Calhoun¹, Julio Fernandez-Mendoza³*¹ Penn State Hershey Medical Center, ² University of California, Berkeley, ³ Penn State College of Medicine

Introduction: Young adults with Autism Spectrum Disorder (ASD) frequently report a multitude of pervasive sleep and circadian problems, including difficulties initiating and maintain sleep, excessive sleepiness, delayed phase, and irregular sleep–wake schedules. These sleep and circadian problems often occur in unison rather than as isolated problems and further impair social functioning, cognition, mood, and overall quality of life, during a particularly challenging developmental stage. Although sleep and circadian problems have been identified as a critical and unmet public health concern for young adults with ASD, and there is a robust evidence for transdiagnostic sleep interventions, there is a paucity of research on the efficacy of these interventions in young adults with ASD.

Methods: Transdiagnostic Intervention for Sleep and Circadian Dysfunction (TranS-C), a patient-centered sleep intervention which has demonstrated improvements in sleep and circadian problems and reduce symptomology in both mental and physical health domains across a variety of mental health disorders, will be adapted and iteratively pilot-tested, so that its contents and service delivery methods are appropriate for young adults with ASD. Qualitative methods (semi-structured interviews) will be used to conduct and analyze feedback from key stakeholders (n=20; 10 dyads of young adults with ASD and their caregivers), and used to directly guide adaptations of TranS-C.

Results: Preliminary data of 5 young adults (18–24y) with ASD show that these individuals are likely to receive multiple sleep disorder diagnoses at equally similar rates (60% circadian rhythm sleep disorder, 60% insomnia disorder), and concurrently present with comorbid mental health problems (60% anxiety disorder, 60% depression).

Conclusion: Our preliminary data along with existing studies suggest that (1) sleep and circadian problems experienced by individuals with ASD are multidimensional in nature, (2) negatively impact daytime functioning, both within several cognitive and mental health domains, and (3) require transdiagnostic approaches in individuals with ASD to address the broader range of sleep and circadian dysfunction experienced. Potential adaptations to TranS-C format and delivery may serve as a novel module for promoting intervention adherence and responding to unique features of ASD.

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0683

SLEEP DISTURBANCE, SOCIAL FUNCTIONING, AND SUICIDAL IDEATION AMONG PREADOLESCENT CHILDREN ADMITTED TO INTENSIVE PSYCHIATRIC CARE*Victor Buitron¹, Ariel Gianukakis², Jared Saletin³, Anthony Spirito², Anne Walters², Justin Parent²*¹ Florida State University, ² Brown University, ³ Department of Psychiatry and Human Behavior, Alpert Medical School of Brown University

Introduction: Research on preadolescent childhood suicidality is sparse, with recent population-based studies providing support for sociodemographic and diagnostic correlates of preadolescent suicidal ideation. Sleep disturbance is of particular interest in the examination of preadolescent suicidal ideation because sleep health is interlinked with childhood psychosocial functioning; further, there are changes in preadolescent homeostatic regulation of sleep–wake and intrinsic circadian rhythm (i.e., delayed sleep onset), and psychosocial pressures in preadolescence, such as bedtime autonomy, that are increasingly manifested. There is a need to test models that begin to delineate associations between sleep disturbance and childhood suicidal ideation, specifically among youth with early-onset psychopathology. One possible explanatory factor in the association between sleep disturbance and suicidal ideation, grounded in existing theoretical frameworks of suicide, is social functioning (e.g., developmentally appropriate peer interactions and connectedness). The current study tested an indirect effects model in which sleep disturbance is associated with suicidal ideation via social functioning.

Methods: 223 children (ages 7–12) with severe psychopathology who presented for intensive hospital-based treatment and their caregivers completed an assessment battery at admission, including the parent-reported sleep disturbances via the Children's Sleep Habits Questionnaire, and child-reported dysregulated negative affect, social functioning, and suicidal ideation. Indirect effects were examined via the PROCESS macro for SPSS Version 4.0. Binary logistic regression was used when suicidality served as the dependent variable. All models controlled for youth age and dysregulated negative affect.

Results: Higher levels of parent-reported youth sleep disturbances were related to lower levels of youth-report social functioning. Further, lower levels of social functioning and higher levels of sleep disturbances were associated with higher odds of endorsing suicidal ideation. Indirect effects analyses indicated that higher levels of sleep disturbances was associated with increased odds of reporting suicidal ideation via the detrimental impact of sleep disturbances on social functioning.

Conclusion: The findings support the novel extension of explanatory models of suicide to children and highlight the possible role of sleep disturbance in the etiology of early suicidality. Documenting these associations provides the impetus for fine-grained examination of sleep health and social functioning among children who experience suicidal ideation and severe psychopathology.

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0684

EFFECTS OF TRANSCRANIAL MAGNETIC STIMULATION (TMS) ON TREATMENT OF INTRUSIVE THINKING IN INSOMNIAC POPULATIONS

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Introduction: Patients with clinical insomnia commonly report intrusive thinking (IT) as a common contributor to delayed sleep onset. Evidence suggests that the default mode network (DMN) may contribute to this intrusive thinking. Therefore, we employed continuous theta burst (cTBS) repetitive transcranial magnetic stimulation (rTMS) to modulate DMN activation, and thus reduce IT before sleep.

Methods: In a counterbalanced cross-over design, active or sham cTBS was administered to 20 participants with clinical insomnia, 8 males (Mage=31.63, SD=6.74) and 12 females (Mage=23.75, SD=4.29), with sessions separated by at least 5 days. To assess intrusive thoughts prior to sleep, participants took the Glasgow Content of Thoughts Inventory (GCTI). We utilized the subscale of the GCTI measuring sleep and wakefulness. Higher scores indicate more persistent intrusive thoughts. We conducted a mixed ANOVA to examine effects of sham and active cTBS conditions on intrusive thoughts.

Results: There was a medium effect size ($\eta^2 = .087$) but no significant variance ($p > .05$) in average IT scores between participants sham cTBS (M=19.100, SD=5.349) and active cTBS (M=18.200, SD=4.502) Post-TMS sessions. There was a significant interaction between sex, TMS, and administration ($F(1,18) = 4.697$; $\eta^2 = .207$; $p = .044$). We then conducted a simple effects analysis between males and females. There was no significant effect of cTBS condition on reported intrusive thinking post-TMS administration ($F(1,7) = .628$; $\eta^2 = .082$; $p = .454$). However, there was a significant interaction of cTBS condition on intrusive thoughts post-TMS administration for females ($F(1,11) = 5.894$; $\eta^2 = .349$; $p = .034$). Post-hoc pairwise comparison revealed that females reported significantly greater intrusive thinking post-TMS administration (M=20.167, SD=5.68) compared to pre-TMS administration (M=17.5, SD=5.73) during their sham cTBS session ($p = .042$). This was not present post-TMS administration during active cTBS ($p > .05$).

Conclusion: There was a decrease in intrusive thoughts relating to sleep and wakefulness in females, but not males, following active TMS. Interestingly, we also observed an increase in intrusive thoughts for the sham condition, suggesting that participants may have developed expectations of improvement and been sensitized to these cognitions when sleep was not improved. These findings are encouraging suggesting that cTBS may improve IT, although preliminary data suggest this may differ between males and females.

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0685

EMOTION REGULATION MODERATES THE RELATIONSHIP BETWEEN SLEEP AND SOCIAL PARTICIPATION

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Introduction: While poor sleep quality has been tied to worse social functioning, this relationship is complex and other variables likely play a role. For instance, emotion regulation and alexithymia are both related to sleep quality and to social functioning. Yet, the impact of these emotional processes on the relationship between sleep and social functioning remains unexplored. This study aimed to fill this gap by assessing whether alexithymia or two emotion regulation strategies—reappraisal and suppression—moderate the relationship between sleep and one aspect of social functioning (participation in social activities). We hypothesized that the relationship between sleep and social participation would be stronger for those who had greater difficulties in these emotional processes (high alexithymia, high suppression, or low reappraisal).

Methods: Data for this study came from the Pittsburgh Cold Study 3, a publicly available dataset (N = 213). Participants completed measures of self-reported sleep, emotion regulation, alexithymia, and social participation. Objective sleep data was also collected via actigraphy.

Results: The Reappraisal subscale significantly moderated the relationship between sleep quality and social participation. For participants with high reappraisal scores, worse sleep quality was related to lower social participation scores. Additionally, the Suppression subscale significantly moderated the relationship between actigraphy sleep duration and social participation. For participants with lower suppression scores, greater sleep duration was related to higher social participation. Alexithymia did not significantly moderate these relationships.

Conclusion: Our results suggest that the ability to effectively regulate one's emotions may be important to consider in the link between sleep and social participation, as the relationship varies depending upon one's use of emotion regulation strategies. Importantly, this sample included only individuals who had no recent mental health treatment. Future work should extend these findings by including a wider range of participants, including those with relevant diagnoses—such as borderline personality and schizophrenia-spectrum disorders.

Support (if any): The data were collected by the Laboratory for the Study of Stress, Immunity, and Disease at the Carnegie Mellon University under the directorship of Sheldon Cohen, PhD; and were accessed via the Common Cold Project website (www.commoncoldproject.com; grant number NCCIH AT006694).

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0686

HIGH PREVALENCE OF SLEEP APNEA IN MENTAL DISORDERS – A NEED FOR USE OF SLEEP EVALUATION TOOLS IN PSYCHIATRIC HEALTH CARE.Adam Wichniak¹, Olga Sikorska², Katarzyna Szaulińska², Aleksandra Wierzbicka³, Daria Smulek¹, Katarzyna Gustavsson³¹ Third Department of Psychiatry, Sleep Medicine Center, Institute of Psychiatry and Neurology, Warsaw, Poland, ² Third Department of Psychiatry, Institute of Psychiatry and Neurology, Warsaw, Poland, ³ Department of Clinical Neurophysiology, Sleep Medicine Center, Institute of Psychiatry and Neurology, Warsaw, Poland

Introduction: Sleep apnea is a prevalent disorder but it is frequently overlooked in diagnosing mental disorders. The aim of the present study was to screen for sleep apnea in a group of patients referred for diagnosing mental disorders or non-restorative sleep and to assess the accuracy with which such testing can be replaced with commonly used screening questionnaires for sleep apnea.

Methods: 104 patients were investigated – 58 with mental disorders (26 with affective disorders, 26 with schizophrenia spectrum disorders, 3 with anxiety disorders, 3 with neurocognitive disorders; mean age 37.5±9.5 years, 24% females, BMI 32.8±6.5 kg/m²) and 46 with non-restorative sleep (mean age 41.2±14.6, 39% females, BMI 26.3±4.8 kg/m²). The patients were screened for sleep apnea with a home sleep apnea test (HSAT) based on peripheral arterial tonometry (PAT) and were asked to fill in the Sleep Apnea Scale from Sleep Disorders Questionnaire (SDQ-SA), the STOP-BANG and the Berlin questionnaires (BQ), and the Epworth Sleepiness Scale (ESS).

Results: Apnea-Hypopnea Index of > 5/h was found in 57 (55%) patients: 36 (62%) patients with mental disorders and 21 (45%) patients with non-restorative sleep. An increased risk for sleep apnea was found in 45 patients (43.3%) using SDQ-SA, 64 (61.5%) using BQ, 80 (76.9%) patients using STOP-BANG with the cut-off of 3 points and 30 (28.8%) with the cut-off of 5 points. Positive predictive values were: 65.9% for SDQ-SA, 71.0% for BQ, 68.8% for STOP-BANG with the cut-off of 3 point and 75.9% with the cut-off of 5 points. Negative predictive values were 49.1%, 63.0%, 83.3% and 51.4% respectively. Diagnostic accuracy was highest for STOP-BANG with the cut-off of 3 points – 72.3% and lowest for SDQ-SA – 56.6%. Excessive Daytime Sleepiness was found in 44 (42.3%) of patients. Three patients (2.9%) refused or did not complete the HSAT.

Conclusion: Inclusion of HSAT in the diagnostic process revealed high prevalence of sleep apnea in patients with mental disorders. Psychiatrists should be encouraged to include HSAT in evaluation of patients. Such testing is patient-friendly and using only screening questionnaires does not provide high enough diagnostic accuracy.

Support (if any):

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0687

LONELINESS, SLEEP, AND HIGH RISK ALCOHOL USE IN COLLEGE STUDENTS BEFORE AND DURING THE COVID-19 PANDEMICCaleb Cutrer¹, J. Roxanne Prichard²¹ University of St Thomas, ² University of St. Thomas

Introduction: The aim of this study is to determine what behavioral and psychological factors were predictive of high-risk drinking in

students with and without a Substance Use Disorder (SUD) diagnosis. We also compared how these relationships differed between Fall 2019, before the COVID-19 pandemic, and Fall 2020, a period of increased financial stress, distance learning, and social isolation.

Methods: We used factor analysis to extract a wide range of behavioral and psychological predictor variables from the Fall 2019 and Fall 2020 American College Health Association's National College Health Assessment III (ACHA-NCHA). Next, we used structural equation modeling to identify significant drivers of high-risk alcohol use (ASSIST alcohol subscale) in students with (n = 577) and without (n = 50,926) SUD diagnosis.

Results: When compared to 2019, both students with and without SUD diagnosis showed lower levels of high-risk drinking, more difficulties falling asleep, and longer sleep duration. In students without SUD, short sleep duration and loneliness were the primary predictors of past year high risk alcohol use. In students with SUD, long sleep latencies and loneliness (UCLA Loneliness Scale) were the primary predictors, and sleep factors predicted more variance in high-risk alcohol use than in the general college population. Students with SUD diagnosis who also had sleep latencies >30 minutes were significantly more likely to report binge drinking (>5 drinks in one sitting) than those with shorter sleep latencies.

Conclusion: Sleep factors and loneliness are large predictors of problematic alcohol use in both students with and without diagnoses of Substance Use Disorder. In the first year of the COVID-19 pandemic, students sleep patterns changed with students reporting longer sleep, but also greater symptoms of insomnia.

Support (if any):

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0688

NOCTURNAL PAIN AND ITS ASSOCIATION WITH QUALITY OF LIFE IN WOMEN: DATA FROM THE EPIDEMIOLOGIC SLEEP STUDY (EPISONO)Leandro Lucena¹, Gilles Lavigne², Cibebe Fabbro²,Monica Andersen¹, Sergio Tufik¹, Helena Hachul¹¹ Universidade Federal de Sao Paulo, ² Faculté de Médecine Dentaire, Université de Montréal, Canada

Introduction: It is known that poor sleep is related to pain, even though this relationship is not fully understood. Women with pain present alterations in sleep pattern and reduced quality of life, but little is known about the negative effects of nocturnal pain on these outcomes. This study aimed to evaluate and compare the levels of anxiety, depression, and fatigue in women with pain during the night with those without pain. We hypothesize that pain perception is associated with worsening fatigue and mood outcomes.

Methods: This cross-sectional study used data from the 2007's Epidemiological Study of Sleep (EPISONO). A total of 574 women aged 20-80 years participated in the EPISONO, and 244 women met the inclusion criteria of our study, 85 in the pain group and 171 in the control group. Participants were categorized into the pain group if they responded positively to the following questions: i) they generally had pain, according to the Pre-Sleep Questionnaire (PSQ), and ii) pain usually interfered with sleep 3 or more times a week, according to the Pittsburgh Sleep Quality Index (PSQI). Participants who responded negatively to these questions were allocated to the control group. All of them underwent a full night laboratory polysomnography, and answered questionnaires related to fatigue, depression, anxiety, and quality of life.

Results: Significantly higher levels of fatigue (5.4 times), anxiety and depression were observed in the pain group, as well

as significantly lower values in all domains of quality of life, compared to the control group. The presence of pain at night was also correlated with levels of anxiety and depression in the psychological ($R_s = -0.463$, -0.607 , respectively) and social ($R_s = -0.423$, -0.438 , respectively) domains of quality of life.

Conclusion: The presence of pain at night in women is related to a decrease in quality of life and can lead to worsening mood disorders and fatigue. Our results show the importance of investigating pain and its consequences, as well as the interference in women's sleep patterns.

Support (if any): Associação Fundo de Incentivo à Pesquisa (AFIP), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) - Finance Code 001, and Conselho Nacional de Pesquisa (CNPq).

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0689

NURSES AND SLEEP: THE RELATIONSHIP BETWEEN PATIENT-RELATED STRESSORS AND SLEEP QUALITY.

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Introduction: Poor sleep quality in nurses is linked to worse psychological health. Identifying which occupational stressors may impact nurses' sleep quality and psychological health may provide an opportunity for intervention. Patient-related stressors such as worrying about and/or an inability to help patients recover or survive hospitalization have a negative impact on a nurses' psychological health. It remains unclear if patient-related stressors also impact nurses' sleep quality. We examined if more patient-related stressors are associated with lower sleep quality in nurses.

Methods: The Worksite Blood Pressure Study is a multi-site study investigating psychosocial factors and ambulatory blood pressure. The study recruited 472 participants from 10 New York City worksites including 105 nurses during 3 waves over 11 years. The current analysis was restricted to 82 nurses at Wave 3. Participants completed the Nurses' Stress Inventory Questionnaire which assessed the frequency and severity of stressful situations at work and a sleep questionnaire. Items on patient-related stressors and sleep quality were examined with higher scores indicating more stress and worse sleep quality, respectively. A linear regression model was specified predicting sleep quality from stressful patient interactions; participants answering at least 8 of the 16 items querying these interactions were included in the analysis. Age, race/ethnicity, religion, personal income, employment tenure, and years of education were included as covariates.

Results: Participants ($N=82$) were 96.3% female, 30.5% Black, 4.8% Hispanic/Latinx, 75.6% Christian. Mean age was 40.2 years ($SD = 7.5$), mean years of education was 15.4 ($SD = 2.2$), mean employment tenure was 8.3 years ($SD = 6.7$), and median personal income was \$55,000 (Range \$17,500, \$95,000). Mean sleep quality was 8.9 ($SD = 2.6$). Nurses who reported greater frequency and severity of patient-related stressors had significantly worse sleep quality, $B = 1.79$, 95% CI 0.20, 3.37, $p = 0.028$. Sensitivity analyses restricting the analysis to nurses with no missing data on stressful interactions replicated these results, $B = 2.22$, 95% CI 0.34, 4.09, $p = 0.022$.

Conclusion: Patient-related stressors were associated with lower sleep quality in nurses. Efforts to increase support to nurses who experience patient-related stressors may help improve nurses' sleep quality and possibly psychological health.

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0690

PEOPLE WITHOUT ANY SLEEP COMPLAINTS ACHIEVE RESULTS THAT EXCEED THE CUT-OFF THRESHOLDS IN STANDARDIZED SLEEP ASSESSMENT.

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Introduction: With increasing prevalence of sleep problems in the general population, a question arises on whether standardized clinical sleep assessment shows results exceeding the cut-off thresholds in healthy subjects who do not report any sleep complaint. The aim of this ongoing study is to assess a sample of healthy subjects who report good sleep quality, for each gender in age groups 18-30, 31-40, 41-50, 51-60, 61-75 years old.

Methods: Up to now 70 healthy subjects have taken part in the project (38 females, 32 males, mean age 39.5 ± 12.5 , median 37 years). Assessment of sleep, and mental health related symptoms was performed using actigraphy, sleep diaries and clinical ratings scales: the Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), Morningness Eveningness Questionnaire (MEQ), Ford Insomnia Response to Stress Test (FIRST), International Physical Activity Questionnaire (IPAQ), STOP-Bang Questionnaire, Sheehan Disability Scale (SDS), Quick Inventory of Depressive Symptoms (QIDS-16SR), Generalized Anxiety Disorders Scale (GAD7), World Health Organization Quality of Life Scale (WHOQOL-BREF).

Results: In ISI scale 20 subjects (28.6%) reported mild and 2 subject (2.8%) moderate insomnia symptoms. In ESS 7 subjects (10.0%) were found to have mild, 5 (7.1%) moderate and 3 (4.3%) severe excessive daytime sleepiness. Anxiety symptoms reported 15 (21.4%) subjects and depressive symptoms 18 (22.9%) subjects. Moderate for risk for sleep apnea was found in 9 (12.8%) and high in one (1.4%) subject. In sleep diaries sleep latency above 30 minutes was found in 4 (5.6%) subjects, WASO above 30 minutes in 7 (10.0%) subjects, total sleep time below 6.5 hours in 22 (31.4%) subjects. Average time in bed was 474 ± 55 minutes and average sleep efficiency $86.8 \pm 7.5\%$. ISI correlated with FIRST ($r=0.496$, $p < 0.001$), GAD-7 ($r=0.445$, $p < 0.001$), QIDS-SR16 ($r=0.483$, $p < 0.001$), sleep latency ($r=0.313$, $p < 0.05$), WASO ($r=0.270$, $p < 0.05$). ESS correlated with FIRST ($r=0.316$, $p < 0.01$), GAD-7 ($r=0.275$, $p < 0.05$).

Conclusion: Substantial proportion of subjects from the general population who did not initially report any sleep complaints obtained results exceeding suggested threshold in standard clinical scale and sleep parameters below normal value in sleep diaries. Poor sleep indices are most related to scales measuring stress, anxiety and depressive symptoms.

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0691

QUALITY OF LIFE AND SUBJECTIVE SLEEP CHARACTERISTICS AMONG A MIDDLE-AGED POPULATION IN KOREA

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Introduction: Sleeping problems are associated with physical and mental conditions as well as quality of life (QoL). This study aimed to evaluate the association between sleep characteristics and QoL in a middle-aged population.

Methods: This cross-sectional study included 4051 adults (1751 males and 2300 females) aged 30-50 who were selected through a multi-stage stratified sampling based on sex, age, and region between 2017 and 2019. Sociodemographic, sleep characteristics, and QoL were evaluated and compared. Sleep characteristics were determined using the Pittsburgh Sleep Quality Index, and were defined as sleep duration (SD), sleep quality (SQ), sleep efficiency (SE), and sleep latency (SL). QoL was evaluated using the SF-12, which calculated physical and mental QoL. Degrees of insomnia symptoms were classified into 0-3 by summing up the number of cases of sleep duration (≤ 6.5 hours), sleep efficiency ($< 85\%$), and sleep latency (> 30 min). We used linear regression models to estimate the relationship between sleep characteristics and degrees of insomnia symptoms with QoL, adjusting for sociodemographic covariates.

Results: Sleep characteristics of the participants include average sleep duration 6.8 hours (≤ 6 h short, 45%; ≥ 9 h long, 3%), sleep quality 4.6 points (poor SQ, 29%), sleep efficiency 94.5% ($< 85\%$ SE, 11%), and sleep latency 19.7 minutes (> 30 min SL, 9%). About 26% had one insomnia symptom and 11% had two or more insomnia symptoms. All sleep characteristics showed significant associations with physical and mental QoL. Particularly, physical QoL was associated with long SD (coefficients [B]: -1.56, 95% confidence interval [CI]: -2.77, -0.35), low SE (B: -2.32, 95% CI: -2.94, -1.7), and long SL (B: -3.3, 95% CI: -3.97, -2.6), and mental QoL was associated with low SE (B: -3.3, 95% CI: -4.0, -2.5) and long SL (B: -5.1, 95% CI: -5.8, -2.5). Physical and mental QoL was significantly linearly decreased with number of insomnia symptoms (for physical QoL, B: -0.87, -2.87, and -4.24; for mental QoL, B: -1.1, -4.01, and -5.9, by number of insomnia symptoms 1, 2, and 3, respectively).

Conclusion: Poor sleep characteristics were negatively associated with QoL in Korean middle-aged adults.

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0692

RELATIONSHIPS BETWEEN SLEEP AND SOCIAL COGNITIVE BIASES IN SCHIZOPHRENIA-SPECTRUM AND BIPOLAR DISORDERS

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Introduction: People with schizophrenia-spectrum disorders (SSDs) and bipolar disorders (BDs) experienced difficulty with social cognition, or the mental processes that underlie social interactions,

but determinants of social cognitive impairment are still under investigation. Research suggests that poor sleep quality is related to reduced social cognitive ability in BDs, but it is unclear if sleep quality is related to social cognition in SSDs and if sleep may be related to different types of social cognition (e.g., emotion recognition, biases) in different ways. This study aimed to examine relationships between sleep and different types of social cognition in SSDs and BDs. Given known relationships between blaming and untrustworthiness biases and paranoia in these populations, paranoia was also examined as potential mediator of these relationships.

Methods: Participants (SSDs $n=91$; BDs with psychotic features $n=87$) completed tasks of social cognitive ability (e.g., facial and multi-modal emotion recognition, attributional bias, untrustworthiness bias). Participants self-reported their sleep quality. Paranoia was assessed via clinical interview.

Results: In the BD group, poor sleep quality ($r=-.23$, $p=.04$) and shorter sleep duration ($r=-.25$, $p=.02$) were associated with a bias towards untrustworthiness. For those with SSDs, increased use of sleep medication was associated with poorer multi-modal emotion recognition ($r=-.22$, $p=.04$). Additionally, poor sleep quality and overall poor sleep were associated with increased blaming ($r=.22$, $p=.03$; $r=.21$, $p=.04$) and untrustworthiness biases ($r=-.24$, $p=.03$; $r=-.24$, $p=.03$) in this group. Higher daytime tiredness was also associated with untrustworthiness bias ($r=-.23$, $p=.03$) in SSDs. Regarding mediation results, paranoia did serve as a mediator in the relationships between sleep and blaming and untrustworthiness biases across the sample.

Conclusion: Results suggest that poor sleep quality is linked to increased attributional and untrustworthiness biases, and that these relationships may be at least partially explained by paranoia symptoms. Of note, however, is that indirect effect sizes in mediation models were small. Contrary to expectations, poor sleep quality was not consistently associated with reduced social cognitive ability in the current sample. Findings from the current study require further exploration and replication.

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0693

REST-ACTIVITY RHYTHM IN METHADONE AND BUPRENORPHINE-MAINTAINED PATIENTS

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Introduction: Opioid use disorder (OUD) is a chronic relapsing disorder with a high overdose death rate. In OUD, sleep and circadian disruptions are highly prevalent, interfere with retention in opioid maintenance treatment (OMT) and increase relapse. Growing evidence suggests a link between sleep/circadian disruptions and dopaminergic (DA) signaling which accounts for addictive properties of drugs of abuse. The current study investigated rest-activity rhythm in Methadone and Buprenorphine-maintained patients and how it relates to DA changes in patients.

Methods: To access rest-activity rhythm, twenty-five OUD patients (9 Females; age 44.34 ± 11.97 ; 60% White, 32% Black; 18 Methadone; 7 Buprenorphine) and thirty-four age, sex, race and BMI-matched healthy controls wore wrist accelerometers for one-week and completed questionnaires for sleep and

chronotype. Among OUD patients, sixteen of them completed [11C]NNC112 and [11C]raclopride PET scans for the assessments of D1R and D2R availability, respectively. Negative mood was assessed as secondary outcomes.

Results: Our preliminary data showed that compared to healthy participants, OUD patients undergoing OMT reported greater sleep problems and showed greater sleep irregularity measured by actigraphy, but no differences in other parameters such as sleep duration, rhythm timing or physical activity. Among patients, greater eveningness and irregularity were associated with higher level of negative mood including depression and anxiety. There is a tendency of a positive correlation between later phase and greater D1 receptor availability and a negative association between sleep irregularity and D2 receptor availability.

Conclusion: Our finding suggests that a link between altered rest-activity rhythm and DA signaling in OUD patients. Circadian/sleep interventions that regulate rest-activity rhythm might benefit mood improvement and promote OUD recovery by normalizing DA transmission.

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0694

SLEEP DISORDERS AND SERIOUS MENTAL ILLNESSES: COMORBIDITY, TREATMENT, & DEMOGRAPHIC FACTORS IN VA HEALTH RECORD DATA

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Introduction: People diagnosed with serious mental illnesses (SMI), including schizophrenia-spectrum disorders, bipolar disorders, and major depression with psychosis, report high rates of clinically significant sleep disturbance. Yet, examination of how demographic- and health-related factors impact diagnosis and treatment in this group is scarce. We aimed to fill this gap by examining medical records of Veterans receiving treatment in VA VISN 4 healthcare facilities.

Methods: We used VA health record data to examine comorbidity between SMI and sleep diagnoses and receipt of sleep treatment from 2011-2019 (total N=573,974). A combination of descriptive and statistical techniques were used to investigate prevalence of sleep disorders, receipt of sleep treatment, and associations with demographic- and health-related factors.

Results: In 2019, 21.8% of Veterans with SMI were diagnosed with sleep disorder(s) in the medical record. White Veterans with SMI were more likely to have a sleep disorder than Veterans identifying as racial minorities. Veterans with SMI and sleep disorders were also younger, had higher BMIs, and had more medical comorbidities. Veterans with SMI were more likely to receive sleep treatment than Veterans without SMI, primarily driven by higher rates of sleep medication. Importantly, in contrast to findings regarding sleep disorder comorbidity, Veterans identifying as racial minorities received sleep treatment at a higher rate than White Veterans, and Veterans with higher BMIs received sleep treatment at a lower rate. Demographic factors including sex, age, and rurality were also associated in varying ways with rates of sleep treatment.

Conclusion: Our findings suggest that Veterans with SMI are being treated for sleep disorders at higher rates than Veterans without SMI. However, diagnosis and treatment are differentially impacted by demographic and health-related factors. Work is needed to better understand drivers of demographic differences and to examine any potential inequities in diagnosis or treatment of sleep disorders in Veterans with SMI.

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0695

THE ASSOCIATION BETWEEN SOCIAL SUPPORT AT WORK AND SLEEP QUALITY

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Introduction: Social support, including support received by coworkers, is associated with one's emotional well-being. Poor sleep quality among employees is associated with worse employee health, increased workplace injury and is a growing occupational health problem. Social support at home is known to positively impact sleep quality. However, whether social support at work affects sleep quality is unknown. We examined whether social support at work is associated with sleep quality.

Methods: The Worksite Blood Pressure study is a multi-site study of psychological factors and ambulatory blood pressure. The study recruited 472 participants without major cardiovascular disease from 10 New York City worksites during 4 waves over 11 years. The current analysis was restricted to 189 employed participants at Wave 4 and provided complete data. Participants completed the Job Content Questionnaire which assessed psychosocial and social characteristics of jobs, including social support received from coworkers and supervisors, and a sleep questionnaire. The sleep questionnaire assessed sleep quality, self-reported sleep duration, alertness, and sleep habits. For this analysis, items related to sleep quality were summed. Higher scores indicated worse sleep quality. A linear regression model was specified predicting sleep quality from social support at work. Study site, age, race/ethnicity, marital status, total number of people at home, and years of education were included as covariates.

Results: Of the 189 participants, 72.5% were male, 16.4% were Black, 7.4% were Hispanic/Latinx, and 73.0% were married. Mean age was 50.1 years (SD = 7.0), mean years of education was 17.8 (SD = 3.2), and median number of people at home was 3 (Range 0, 6). Mean support at work was 23.3 (SD = 3.9) and mean sleep quality was 8.6 (SD = 4.4). Social support at work was not significantly associated with sleep quality, $B = 0.12$, 95% CI -0.29, 0.05, $p = 0.16$. Sensitivity analyses that examined support from supervisors and from coworkers separately were also not significant, $p > 0.20$.

Conclusion: Social support at work was not significantly associated with sleep quality in our cohort. Factors beyond social support at work should be investigated to evaluate their associations with employees' sleep quality.

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0696

THE MODERATING ROLE OF SLEEPINESS AMONG INTRADAY PASSIVE AND ACTIVE SUICIDAL IDEATION

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Introduction: Disrupted sleep has been linked to suicidal thought and behavior. Less is known regarding underlying mechanisms of this relationship. A more nuanced understanding of the link between sleep and suicide may help inform treatment decisions and the development of prevention and intervention strategies. We examine prior day sleepiness as a moderator to the relationship between passive and active suicidal ideation (SI).

Methods: Young adults (mean age=21.04; SD=2.22) endorsing SI (n=59) at least twice in the past two weeks were enrolled in a trial examining potential iatrogenic effects of the ecological momentary assessment (EMA) of SI. A baseline battery collected data on past suicidal thought and behavior, demographics, and psychological distress. EMA surveys were administered randomly five times per day over four weeks and assessed sleepiness and current emotional state including occurrence and severity of SI and passive/active ideation.

Results: Altogether, 835 daily average EMA entries were utilized in the present analysis. A significant relationship ($p < .05$) was observed between sleepiness and passive SI and its impact on the intensity and duration of SI. Specifically, the association between passive and active SI was stronger on days that participants endorsed greater sleepiness. There was also a significant interaction such that one's desire to die and a low desire to stay awake significantly interacted ($p < .05$) to predict same-day perceived controllability of SI. Meaning that when participants had a lower desire to stay awake, there was a stronger relationship among perceived ability to control one's SI and lower desire to live.

Conclusion: This study examined the impact of daily sleepiness on relationships among passive and active SI among young adults endorsing suicidal thought. Findings indicate that the relation between daily passive and active SI severity grows stronger the sleepier one is relative to their average level of sleepiness. Future studies should incorporate objective measures of sleep to further explore these findings and clinical implications.

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0697

THE RELATIONSHIP BETWEEN ANGER EXPRESSION AND SLEEP

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Introduction: Increased anger expression (AE) is linked to worse health outcomes. Short sleep duration and poor sleep quality are

linked with increased anger. However, few data have examined whether increased AE may lead to disturbed sleep. We examined if AE is associated with objectively and subjectively-assessed sleep measures in two cohort studies.

Methods: The Masked Hypertension Study (MHTN, n=888) is a multi-site study of the prevalence and predictors of masked hypertension. Participants completed the Spielberger Anger Expression Scale (SAES) and the Pittsburgh Sleep Quality Index. Sleep duration and percent of time awake after sleep onset (%waso) during a 24-h period were derived from wrist-worn actigraphy (ActiWatch; Phillips Respironics), supplemented by diary reports. The Worksite Blood Pressure study (WSBPS, n=472) is a multi-site study of psychological factors and ambulatory blood pressure. Participants completed the SAES and a sleep quality questionnaire. In MHTN, linear regression models were estimated for each sleep outcome with age, sex, race/ethnicity, and anxiety as covariates. In the WSBPS, the analysis was conducted for sleep quality only, controlling for age, race/ethnicity, anxiety, sleep apnea, and study site.

Results: Participants in MHTN (n=782) were 59.5% female, 11.5% Hispanic/Latinx. Mean age was 45.5 years (SD = 10.4). Mean AE was 34.7 (SD = 6.6). Mean sleep duration was 6.3 hours (SD = 1.1), mean %waso was 7.1% (SD = 4.0), and mean sleep quality was 5.6 (SD = 3.2). AE was not significantly associated with sleep duration, $B = 0.01$, 95% CI -0.01, 0.02, $p = .30$, waso, $B = 0.02$, 95% CI -0.03, 0.07, $p = .43$, or sleep quality, $B = 0.01$, 95% CI -0.03, 0.05, $p = .71$. Participants in WSBPS (n=278) were 23.7% female, 6.1% Hispanic/Latinx and mean age was 53.1 years (SD = 8.5). Mean AE was 46.8 (SD = 5.0). Mean sleep quality was 8.4 (SD = 4.4). AE was not significantly associated with sleep quality, $B = -0.014$, 95% CI 0.14, 0.07, $p = 0.50$.

Conclusion: AE was not associated with objective or subjectively-assessed sleep measures. Our findings may suggest that clinicians should focus on other factors rather than AE to improve sleep.

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0698

CONTRASTING PAINFUL AND PAINLESS RESTLESS LEGS PHENOTYPES: AN ADULT TWIN FAMILY STUDYDavid Champion¹, Minh Bui², Phillip Aouad¹, Georgia Ng¹, Emily Joyce³, Arthur Teng⁴, Elias Karroum⁵, Arthur Walters⁶, Tiina Jaaniste¹, John Hopper²

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Introduction: Several studies characterized painful and painless restless legs syndrome (RLS) phenotypes based on clinical, topographical, polysomnographic, and genetic background. One pediatric twin family study demonstrated a clear contrast between these two forms of RLS. The painful pediatric RLS being familial, probably genetically influenced, and associated with primary pain disorders (non-migraines headaches; recurrent abdominal pain), the painless pediatric RLS being familial but probably not genetically determined, and associated with iron deficiency, female gender, and persistent/chronic pain disorders. The current study investigated these contrasting painful and painless RLS phenotypes in the adult population.

Methods: The Twins Research Australia database was used to recruit adult twins and their families. The subjects were surveyed and responded to questions related to their demographics, the Cambridge-Hopkins diagnostic questionnaire for RLS diagnosis and categorization into painful and painless RLS subgroups, the history of physician-confirmed iron deficiency, the presence of selected chronic and primary pain disorders, and also other medical, non-pain conditions associated with RLS. Association analyses, using logistic regression with application of generalized estimating equations to control for twin influences, and adjusting for gender and age, were conducted.

Results: A total of 1449 adult subjects responded to the RLS diagnostic questionnaire and to pain related and other medical conditions questions (64.4% females). A total of 1327 adult subjects responded to the iron deficiency pertinent questions (65.7% females). Numbers of dizygous twins and painful RLS subjects were insufficient for heritability testing and for association analyses with medical conditions. Painless RLS was associated with iron deficiency (OR= 1.59; p=0.003), while painful RLS was not (OR=1.26; p=0.444). Painful RLS was associated with migraine (OR=2.35; p=0.004), recurrent abdominal pain (OR=1.96; p=0.026), growing pains (OR=2.13; p=0.050), diverse chronic pain (OR=2.88; p=0.017), chronic spinal pain (OR=3.65; p=0.001) and dysmenorrhea (OR=2.46; p=0.009). Painless RLS was not associated with any pain disorder.

Conclusion: This study further confirmed contrasting associations in adults with painless and painful phenotypes of RLS (association with iron deficiency and multiple pain disorders, respectively).

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0699

LONGITUDINAL ASSESSMENT OF BUPRENORPHINE EFFECTIVENESS FOR SEVERE RESTLESS LEGS SYNDROME AND DOPAMINERGIC AUGMENTATIONJoseph Andrew Berkowski¹, Lu Wang², Reena Mehra³

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Introduction: Opioids are a consensus second-line treatment for moderate-to-severe restless legs syndrome (RLS). Due to its partial mu-opioid receptor agonist mechanism, buprenorphine (bup) has lower risk of respiratory depression, euphoria, and dependence than full-agonist opioids. We hypothesize that with long-term administration for severe RLS, bup is both effective and well-tolerated and can facilitate successful weaning off dopamine agonists (DA) for patients with augmentation.

Methods: We conducted a longitudinal examination of a retrospective cohort of patients prescribed bup over a 21-month period by a tertiary RLS specialist. Patient-reported outcomes were administered through patient-completed electronic health record-based questionnaires or by clinician interview: International RLS Study Group(IRLS-SG,primary outcome), Clinical Global Impressions of Improvement(CGI-I), Epworth Sleepiness Scale(ESS), Insomnia Severity Index(ISI), Patient Health Questionnaire(PHQ-9), and Patient-Reported Outcomes Measurement Information System-Sleep Disturbance domain(PROMIS-SD). A linear mixed model assuming compound symmetry correlation structure was used (least square means,95%CI) to test the change from baseline to 6-week, 3-month, 6-month, and 1-year intervals, and the final visit, irrespective of time from baseline, with adjustment of age, sex, other RLS meds at final visit, and administration of iron infusion.

Results: 55 patients (56.4% female, 64.9±12.1 years) started bup for RLS, and 42(76.3%) remained on bup at the final visit. IRLS-SG was 27.8(25.3,30.3) at baseline and was significantly reduced at every interval (p of trend < 0.001), including 11.4(7.4,15.4) at 1 year. Of the 39(70.9%) patients that were on a DA with augmentation at baseline, 32(82.1%) had discontinued DAs with 5(12.8%) on a reduced dose at the final visit. Of those remaining on bup at the final visit, 93.8% were CGI-I responders. There was a statistically significant longitudinal trend in 1-year improvement in ESS:9.9(8.0,11.8) to 6.9(4.5,9.4),p=0.003, ISI:18.0(15.9,20.1) to 15.0(11.6,18.3),p=0.048, PHQ-9:10.4(8.2,12.5) to 6.1(3.6,8.6),p< 0.001, and PROMIS-SD:63.0(60.2,65.7) to 53.8(49.8,57.8),p< 0.001. 13(23.6%) discontinued bup with nausea, cognitive complaints, and dizziness as the most common side effects.

Conclusion: In this largest cohort to date to examine buprenorphine in severe RLS, our findings show buprenorphine markedly reduced RLS symptoms, effectively enabled the elimination of dopamine agonists in patients with augmentation, improved sleep and other health quality measures, and was tolerated comparably to other RLS medications.

Support (if any):

Abstract citation ID: zsad077.0700

0700**PARASOMNIA-RELATED HOMICIDES: A SYSTEMATIC REVIEW AND A CRITICAL ANALYSIS OF THE MEDICAL LITERATURE***Anna Castelnovo¹, Matthias Schraemli¹, Carlos Schenck², Mauro Manconi³*¹ University of Southern Switzerland, ² University of Minnesota Medical School, ³ Sleep Medicine Unit, Neurocenter of Southern Switzerland, Lugano, Switzerland

Introduction: Cases of homicide allegedly committed during sleep have been described since ancient history. The strongest link between violence and sleep disorders is represented by the so-called parasomnias, a group of sleep disorders characterized by episodic undesirable behaviors and/or mental experiences that arise during sleep.

Methods: We conducted a systematic search according to the PRISMA guidelines with 4 different search engines (Pubmed, Scopus, Embase and Cochrane) with the aim of gathering and critically evaluating all described cases of homicides associated with parasomnias

Results: We identified over 30 cases of homicide allegedly committed during a parasomnia episode. The diagnosis was of NREM sleep parasomnia for all cases except one, which received a diagnosis of REM-sleep behavior disorder (RBD). Victims were more often female family members, killed by firearms or sharp objects, usually nearby the bed. Aggressors often reported delusional/hallucinatory mental experiences associated with their episodes and rarely made any effort to cover up the crime. In the majority of the cases, no objective sleep data were available. Only a minority of patients had a positive childhood or family history. The court judgement was not uniform across cases.

Conclusion: Although rarely, homicides could be committed during parasomnias episodes. Despite being more frequently associated with violent behaviors, RBD less likely led to fatal aggressions. According to the observed behaviors, subjective reports and current neurophysiological knowledge, patients are only partially conscious and largely disconnected from the external environment, and could not be considered guilty for their actions.

Support (if any): None

Abstract citation ID: zsad077.0701

0701**PERCEPTIONS OF PEOPLE WITH RESTLESS LEGS SYNDROME ON THE EFFECT OF EXERCISE ON SYMPTOMS: RESULTS OF A NATIONWIDE SURVEY***Katie Cederberg¹, E. Morghen Sikes², Emmanuel Mignot¹*¹ Stanford University, ² Shenandoah University

Introduction: Restless legs syndrome (RLS) is a prevalent, sensorimotor sleep disorder that significantly disrupts sleep and is associated with increased risk of cardiovascular disease, hypertension, stroke, depression and anxiety, and causes overall poorer health. As two key diagnostic features of RLS include the worsening of symptoms at rest and relief by movement, there is increasing interest in utilizing physical activity and exercise to manage symptoms. The present study describes personal perceptions of the effects of exercise on symptoms of RLS.

Methods: Participants (N=528) completed a mixed-methods, nationwide survey including items assessing personal experiences with exercise and RLS (both positive and negative) as well as RLS diagnosis, RLS severity, and demographic and clinical characteristics.

Results: Most respondents (72%) perceived that exercise improves RLS symptoms with only a small proportion (13%) perceiving exercise only makes symptoms worse. Participants described any abrupt change in exercise would almost always elicit RLS symptoms (e.g., hiking for a long time, stopping an exercise routine) and that a consistent pattern of exercise seemed to be associated with improvements in RLS symptoms and an overall beneficial effect on frequency of symptomatic bouts. Most (55%) perceived exercise in the morning (4AM to noon) improved their symptoms and 56% perceived exercise in the afternoon/evening (4PM to 11 PM) made symptoms worse. Participants described several questions that they wanted answered regarding the evidence for exercise in RLS and specific exercise prescription recommendations.

Conclusion: Our results suggest that there is individual variation in the response to exercise, whereby some people experience improvements in symptoms with exercise, while others experience worsening of symptoms with exercise. Such individual differences and specific attributes should be considered in exercise-based management to further optimize personalized treatment plans to prevent and manage symptoms in people with RLS.

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0702**SUICIDALITY IN PATIENTS USING OPIOID MEDICATIONS TO TREAT SEVERE, REFRACTORY RESTLESS LEGS SYNDROME: PREVALENCE AND ASSOCIATIONS***Jordana Zackon¹, John Winkelman¹*¹ Massachusetts General Hospital

Introduction: Prior investigations demonstrate a high prevalence of suicidal ideation and behavior in Restless Legs Syndrome (RLS) patients, particularly those with depression and severe RLS symptoms. The present study examines the prevalence of, and associations with, active suicidal ideation (ASI) and passive suicidal ideation (PSI) in patients using prescribed opioids for severe refractory RLS.

Methods: The National RLS Opioid Registry is an observational longitudinal study consisting of individuals taking a prescribed opioid for diagnosed RLS, nearly all with previously augmented symptoms. Information on opioid dosages, side effects, past and current concomitant RLS treatments, RLS severity, psychiatric symptoms, and opioid abuse risk factors were collected at baseline and every 6 months thereafter by REDCap surveys. Two years following enrollment, the C-SSRS was utilized to assess both PSI and ASI in the previous year, whereas the last question on the PHQ-9 assessed PSI in the past two weeks.

Results: At baseline, participants reported a reduction in previous suicidality following initiation of opioids: ASI from 22.0% to 7.0%, and PSI from 36.7% to 13.4%. At the 2-year PHQ-9 survey, 10.1% of registry participants reported PSI within the two previous weeks. At that same 2-year assessment, on the C-SSRS, 7.8% of participants reported both PSI and ASI in the

past year. Overall, suicidality was associated with depression, anxiety, female sex, and perceived opioid stigma. PSI was less likely to be present in those taking methadone. Serial mediation analysis found that both RLS severity and depression severity moderated the relationship between methadone use and PSI. Specifically, methadone use was associated with decreased RLS severity, which was associated with decreased depression severity, and then further, less PSI.

Conclusion: Maximal treatment of RLS symptoms and approaches which mitigate the other clinical features associated with ASI and PSI in this population (anxiety, depression, stigma) are worthy of independent therapeutic attention. Similarly, this data may be useful for prescribers when assessing the appropriateness of opioid treatment for individual patients.

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0703

THE BURDEN OF OBSTRUCTIVE SLEEP APNOEA AND PERIODIC LIMB MOVEMENTS DURING SLEEP ON SYMPTOMS OF PARASOMNIA

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Introduction: Both obstructive sleep apnoea (OSA) and periodic limb movements during sleep (PLMS) may trigger arousals which could induce parasomnias. However, the burden of OSA and PLMS in parasomnia is not fully understood. The aim of the study was to understand the prevalence of OSA and PLMS and their association with symptoms of parasomnia in patients referred with parasomnia for an inpatient polysomnography (PSG).

Methods: In this retrospective project we analysed demographics, medical history and PSG data of 94 patients with parasomnia. The relationship between symptoms of parasomnia, OSA and PLMS were analysed with logistic regression analyses. Data are expressed as odds ratio /95% confidence intervals/.

Results: Forty-seven patients were diagnosed with OSA and 19 with PLMS. Parasomnia symptoms consisted dream enactment (n=28), abnormal movements (n=35), sleep talking (n=36), confusional arousals (n=27), sleep walking (n=36), night terrors (n=18), nightmares (n=15), sleep eating (n=8) and sexsomnia (n=2). Based on symptoms and PSG results, 45 were diagnosed with REM-parasomnia, 63 with non-REM parasomnia, 14 had overlap (both REM and non-REM parasomnia). Interestingly, non-REM parasomnias were inversely related to both OSA (-0.89 /-1.77-0.00/) and PLMS (-1.60 /-2.69- -0.55/, $p < 0.01$). More particularly, OSA was less prevalent in patients with night terrors (-1.52 /-2.72- -0.32, $p < 0.01$), whilst PLMS was more prevalent in patients with dream enactment (1.26 /0.21-2.30/, $p=0.03$), but was less prevalent in patients with nightmares (-2.30 /-5.164-0.56/, $p=0.03$), and with sleep walking (-1.96 /-3.49- -0.42/, $p < 0.01$).

Conclusion: Both OSA and PLMS are prevalent in patients with parasomnia, however their association with specific diseases and symptoms is less evident. Further studies are necessary to understand if they could be treatable traits in parasomnias.

Support (if any):

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0704

A PSG STUDY OF THE EFFECT OF CLONAZEPAM AND MELATONIN ON REM SLEEP WITHOUT ATONIA IN ISOLATED REM SLEEP BEHAVIOR DISORDER

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Introduction: Although very few prospective clinical trials are available assessing the benefits of drugs in isolated REM sleep behavior disorder (iRBD), clonazepam and melatonin are considered as the first-line treatment options. However, while evidence supporting the efficacy of these two compounds on the clinical behavioral outcomes seems to be clear, it is not clear if they are able to significantly modify the main polysomnographic (PSG) feature of iRBD, i.e. REM sleep without atonia (RSWA). For this reason, we carried-out an observational cross-sectional retrospective PSG study of the effects of clonazepam and melatonin on RSWA.

Methods: A total of 83 iRBD patients (70 males and 13 females, age range 50.9-83.2 years) were enrolled in this study: 43 drug-free, 21 patients taking at bedtime chronically (>6 months) clonazepam (0.5-2 mg), seven patients taking melatonin extended-release alone (2-3 mg), and 12 taking a combination of clonazepam and melatonin extended-release (same doses as above). PSG studies were assessed for all subjects, including the measurement of the automatic REM sleep atonia index (RAI) and periodic leg movements during sleep, as well as a series of demographic and clinical variables, such as age, age at onset, disease duration, clinical global impression scale (severity and improvement), mini-mental state evaluation, and RBD severity scale.

Results: None of the outcomes considered in this study showed significant differences between the groups considered. All showed low average values of RAI, as expected, and there were no differences between patients taking clonazepam, melatonin, or a combination of them (drug-free 0.778 ± 0.184 , clonazepam 0.797 ± 0.183 , clonazepam+melatonin 0.692 ± 0.224 , melatonin 0.673 ± 0.228 ; ANOVA $F = 1.329$, $p = 0.271$), despite the clinical global impression scale-improvement was reported to be "much improved" or "minimally improved" in all treated patients.

Conclusion: This study confirms our previous findings in smaller patient series taking only clonazepam and suggest that both clonazepam and melatonin might be beneficial on some clinical manifestations of iRBD but are unable to modify its underlying neurophysiology. This might also indicate that these agents do not seem to interfere with the core mechanisms of this disease and other disease modifying drugs need to be discovered for iRBD.

Support (if any):

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0705**RESTLESS SLEEP DISORDER AND PERIODIC LIMB MOVEMENT DISORDER IN CHILDREN WITH HISTORY OF PREMATURITY**

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Introduction: Children with history of prematurity are at higher risk of complications, comorbidities and iron deficiency, including restless legs syndrome and periodic limb movements of sleep (PLMS). In this study we assess the prevalence of restless sleep disorder and PLMS in children with history of prematurity.

Methods: Retrospective chart review of sleep studies in children aged 1-18 years, with history of prematurity, from July 2021 to July 2022 at Seattle Children's Hospital. Only diagnostic studies in children without diagnosis of a genetic syndrome or airway surgery were included.

Results: During the study, 2,577 sleep studies were conducted, 162 were in children with history of prematurity (6%); 25 were split or titration studies (14%), 29 children had syndromes (Down, Prader Willi, Wiedmann Beckmann, Achondroplasia), 4 tracheostomy studies, 6 in infants aged < 12 months and 6 were post airway intervention. Ninety-two diagnostic studies were included in analysis. Median birth age was 31 weeks, interquartile range (IQR) 27-34 weeks. Thirty-two (34.8%) children were referred for restless sleep and 55 (59.8%) for snoring; 18% had PLMS index >5/hour, 14% fit the criteria for restless sleep disorder (RSD). There were no statistically significant differences in PSG parameters between the children with RSD, PLMS and the remaining group, except for lower obstructive apnea/hypopnea index (Kruskal-Wallis ANOVA 8.621, $p=0.0135$) in the RSD group (median 0.7, IQR 0.3-0.9) than in the PLMS (median 1.7, IQR 0.7-3.5), or than in the nonRSD/nonPLMS group (median 2.0, IQR 0.8-4.5). Altogether, children with RSD and those with PLMS had restless sleep as an indication for the sleep study in 70% of cases while snoring was the indication in only 26.7% of them.

Conclusion: We have previously reported that in the Seattle Children's Hospital Sleep Center the prevalence of RSD is 7.7% and that of PLMS is 9.3%; in this new analysis we found a higher frequency of RSD and elevated PLMS in children with history of prematurity. Premature children are higher risk of iron deficiency, among other complications and comorbidities. These new results confirm the previous reports of increased PLMS and add new knowledge on the prevalence of RSD in these children

Support (if any):

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0706**SLEEP RELATED BRUXISM, HEADACHES AND CARDIOVASCULAR DISEASES**

Ken Luco¹

¹ n/a

Introduction: Sleep-related bruxism is a movement-type sleep disorder affecting 10-12% of the population. It affects men and women equally and has been shown to be a risk factor for cardiovascular disease, tension, and migraine-type headaches

(without auras). This disorder is very destructive to the dentition, reduces deep sleep, and can result in significant pain and dysfunction.

Methods: Review of the literature as well as clinical findings.

Results: Sleep-related bruxism affects the trigeminal cardiac reflex resulting in a significant sympathetic stimulation of the cardiovascular system.

Conclusion: Sleep-related bruxism is a risk factor for cardiovascular disease as well as tension and migraine-type headaches (without auras).

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0707**SPINAL CORD STIMULATION FOR RESTLESS LEGS SYNDROME: CASE REPORT AND SCOPING REVIEW**

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Introduction: Restless legs syndrome (RLS) can dramatically impair sleep quality and quality of life. Some patients have insufficient treatment response or intolerance to available pharmacological options. Exploration of novel therapeutic approaches is needed.

Methods: We report a case of spinal cord stimulation (SCS) providing benefit in RLS. We also performed a scoping review of SCS in RLS with comprehensive literature search of MEDLINE, EMBASE, Cochrane, and Scopus.

Results: A 77-year-old woman with DM2, OSA (on ASV), depression, familial RLS and iron deficiency with typical RLS symptoms for all of her adult life presented for management in 2000. In 2011 she developed intractable painful peripheral neuropathy and chronic back pain. Levodopa, pramipexole, oral/intravenous iron, gabapentin, pregabalin, tramadol, oxycodone, and methadone were ineffective or poorly tolerated. A 7-day percutaneous SCS trial resulted in RLS symptoms improvement initially by 50%. A Medtronic stimulator with lead placement at T8-T9 was implanted. 6 months later, the patient toggled between a tonic program (2.1-4.6 mA, 200 us, 50 Hz) and a sub-perception, differential target multiplexed program duty-cycled to 1:2 on:off (3.7 mA, 170 us, 300 Hz). She reported 75% improvement in RLS symptoms. Pain improved by 50%. Total daily dose of Oral Morphine Equivalents was reduced from 48.75mg/day to 37.5mg/day, with a stable once daily dose of 400 mg gabapentin at night. Uninterrupted sleep went from 2-5 hours to 6 hours. RLS worsened when the device was off. Our case corroborates the current evidence of benefit of SCS for RLS from the literature. We identified other 16 unique patients from case reports and series who had undergone SCS for RLS. Leads were most often implanted in mid or low thoracic levels. Stimulation waveforms were high frequency in 4 patients, tonic in 3 patients, burst stimulation in 1 patient, and undescribed in the others. All patients had RLS symptom reduction. Comorbid pain was reported in 14 patients, which also improved with SCS. Complication with lead erosion was reported in one case.

Conclusion: SCS remains a promising therapeutic approach for refractory RLS that deserves further investigation. SCS may reduce hyperexcitability seen in RLS by modulating dysfunctional spinal, subcortical, and cortical networks.

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0708

SYSTEMATIC REVIEW OF BEHAVIORAL TREATMENTS FOR NREM PARASOMNIAS

Jennifer Mundt¹, Matthew Schuiling², Chloe Warlick¹,Annie Wescott¹, Muriel Hageaars³, Ansgar Furst⁴, Kelly Baron⁵¹ Northwestern University, ² Indiana University-Purdue University Indianapolis, ³ Utrecht University, ⁴ Stanford University, ⁵ University of Utah

Introduction: NREM parasomnias are often benign and transient, requiring no formal treatment. However, parasomnias can also be chronic, disrupt sleep quality, and pose a significant risk of harm to the patient or others. Numerous behavioral strategies have been described for the management of NREM parasomnias, but there have been no published comprehensive reviews. This systematic review was conducted in order to summarize the range of behavioral interventions and their efficacy.

Methods: We conducted a systematic search of the literature to identify all publications describing behavioral treatment of NREM parasomnias (confusional arousals, sexsomnia, sleepwalking, sleep terrors, sleep-related eating disorder, parasomnia overlap disorder). The search was conducted on March 10, 2021 in the following databases: Ovid (MEDLINE), Cochrane Library databases (Wiley), CINAHL (EBSCO), and Web of Science (Clarivate). The search yielded 2411 records. After removing duplicates, 1703 unique records were screened. This yielded 159 publications for full-text review. While reviewing those publications, an additional 83 were identified for screening. Based on the full-text reviews, a total of 66 publications were included in the systematic review, including manuscripts in English (n=63), Dutch (n=2), and German (n=1).

Results: Most included manuscripts were case studies, case series, or retrospective chart reviews. There were only three randomized controlled trials. Children (< 18 years) were included in 33 publications and adults were included in 36. Numerous behavioral strategies were reported, the most common being hypnosis (n=33) and various types of psychotherapy (n=26). Additional interventions included sleep hygiene (n=15), education/reassurance (n=13), relaxation (n=10), scheduled awakenings (n=9), and sleep extension or scheduled naps (n=8). In many studies, multiple interventions were trialed in combination. Length of follow-up varied considerably both within and between studies (range=0-9 years). Outcome measures were inconsistent across studies and some included only qualitative descriptions. Quantitative outcomes included the frequency of symptoms and patient ratings of symptom severity.

Conclusion: This review highlights the wide breadth of potential interventions for managing NREM parasomnias without medication. Randomized controlled trials are needed to determine which interventions are most efficacious, including which are best for particular disorders or ages. Future trials should include standardized quantitative measures of symptoms in order to allow comparison across trials.

Support (if any):

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0709

CHRONOTYPE CHARACTERISTICS IN RESTLESS LEGS SYNDROME

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Introduction: There are many people with a late chronotype in restless legs syndrome (RLS) patients. This phenomenon may be caused by sleep disturbance due to lower extremity symptoms of RLS, or it may be caused by some disease-specific characteristic of RLS, involving the circadian system. The aim of this study is to estimate the cause of this phenomenon.

Methods: This study is a retrospective study and was performed on 100 RLS patients without other major sleep disorders and 51 control subjects. Patients taking hypnotics such as benzodiazepines, melatonin, and zolpidem were also excluded. A survey on various sleep questionnaire scores was made for RLS patients. The questionnaire scores between the two groups were compared, and the collected data were analyzed with a significance level of 0.05.

Results: When the severity of RLS was evaluated by the IRLS score and the proportion of patients with late chronotype was checked by severity, it was 31.1% in the mild group, 41.7% in the moderate group, and 52.6% in the severe group (p=0.420). When the patient group with mild severity was compared with the entire patient group, the PSQI level was 82.0% of the total patient group (p=0.026).

Conclusion: RLS patients are more likely to have a late chronotype than those without RLS. The higher the severity of RLS symptoms, the higher the rate of having a late chronotype. Therefore, it could be inferred that the late chronotype identified in RLS patients was secondary to sleep disturbances caused by RLS symptoms.

Support (if any):

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0710

EFFECTS OF TONIC MOTOR ACTIVATION (TOMAC) THERAPY ON SLEEP QUALITY FOR REFRACTORY RESTLESS LEGS SYNDROME

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Introduction: Tonic motor activation (TOMAC) is a noninvasive medical device therapy that has been shown to reduce symptoms of refractory restless legs syndrome (RLS). Here, we evaluated the effects of TOMAC on subjective sleep quality.

Methods: One hundred and thirty-three adults with primary moderate-severe refractory RLS were 1:1 randomized to TOMAC or sham control for 4 weeks. Participants were instructed to self-administer a 30-minute TOMAC session bilaterally over the head of the fibula to electrically stimulate the peroneal nerve

whenever RLS symptoms presented. Sleep quality was assessed through prespecified analysis of changes to Medical Outcomes Study Sleep Scale (MOS-Sleep) Sleep Problems Index I (MOS-I) and II (MOS-II) scores from baseline to Week 4. Post hoc t-tests were conducted on each MOS-Sleep item included in the MOS-I or MOS-II.

Results: MOS-I score changed by -11.8 points (48.5 to 36.7) for TOMAC and -2.8 points for sham (44.5 to 41.7), a difference of -9.0 points ($p < 0.001$). MOS-II score changed by -13.7 points (52.5 to 38.9) for TOMAC and -4.0 points for sham (48.3 to 44.3), a difference of -9.7 points ($p < 0.001$), which exceeds the proposed minimal clinically important difference (MCID) of 6 points. Post hoc analysis demonstrated statistically significant reductions in trouble falling asleep (item #7; -34.0% for TOMAC vs. -5.8% for sham; $p < 0.01$) and trouble staying awake during the day (item #9; -33.6% for TOMAC vs. -2.1% for sham; $p < 0.05$), which exceeded the standard MCID threshold of 30% relative to baseline.

Conclusion: For adults with refractory RLS, TOMAC improved subjective sleep quality, sleep latency, and daytime somnolence relative to sham control. Each of these improvements represented clinically important improvements. These data demonstrate that TOMAC can provide meaningful improvements to sleep quality and daytime functioning for patients with refractory RLS.

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0711

HEALTH-ECONOMIC IMPLICATIONS OF TONIC MOTOR ACTIVATION (TOMAC) THERAPY FOR RLS: AN EXPLORATORY ANALYSIS BASED ON THE RESTFUL STUDY

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Introduction: Restless legs syndrome (RLS) is a debilitating condition associated with reduced health-related quality of life (HRQoL) and increased resource utilization. Recently, the RESTFUL study demonstrated significant improvement in RLS severity following treatment with a novel non-invasive neuromodulation treatment (Tonic Motor Activation; TOMAC). Our objective was to provide model-based estimates of quality-adjusted life year (QALY) gain and reduction in healthcare utilization that might be expected for the observed changes in symptom severity.

Methods: The RESTFUL study randomized $n=133$ subjects 1:1 to active TOMAC treatment and sham control, with change in International Restless Legs Scale (IRLS) scores reported at four weeks at the end of the randomization period. Functional relationships between IRLS and HRQoL and resource utilization were derived from two prior health-economic studies (Happe et al. 2009 and Durgin et al. 2015). Model-projected quality-adjusted life year (QALY) gain and events avoided at a five-year analysis horizon were calculated based on assumption of maintained treatment effect.

Results: From baseline of 25.2, change in IRLS at four weeks was -7.2 for the active and -3.8 for the sham group (between group difference -3.4, $p < 0.01$). Based on this effect size, TOMAC was projected to add 0.16 QALYs over 5 years (0.39 when considering reduction from baseline). Based on lower symptom severity, TOMAC was projected to avoid 3.80 (8.05) health care provider visits, 0.29 (0.62) ER visits, and 0.12 (0.26) hospitalizations over 5 years, resulting in a relative risk (RR) of composite healthcare utilization of 0.94 (0.88).

Conclusion: The findings of this exploratory analysis suggest TOMAC-associated improvements in RLS severity as observed in the RESTFUL study may lead to meaningful improvements in patient quality-of-life and concurrent reductions in healthcare utilization. Further investigation is warranted.

Support (if any): Wing Tech Inc. (AMR, KNC, JBP) received consulting fees from Noctrix Health. AR is an investigator in the RESTFUL study.

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0712

IMPROVED CIRCADIAN REST-ACTIVITY PATTERNS AFTER TREATMENT WITH PAP THERAPY IN THE PATIENT WITH IDIOPATHIC RBD AND COMORBID OSA

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Introduction: Several studies suggest that sleep and circadian rhythm disruptions, and physical activity changes may serve as risk factors for the occurrence of Parkinson's disease and its prodromal features. Obstructive sleep apnea (OSA) is commonly found in patients with RBD. The comorbid OSA is associated with non-motor symptoms, including daytime sleepiness, cognitive decline and autonomic nervous system dysfunction. Therefore, we investigated whether circadian rest-activity patterns and RBD-related symptoms will be improved after positive airway pressure (PAP) therapy in patients who had iRBD with comorbid OSA.

Methods: Seven patients were diagnosed as iRBD with OSA (AHI ≥ 10) confirmed by video-polysomnography. The patients wore actigraphy devices for 14 consecutive days before and after PAP therapy for 3 months. The mean motor activity amount (MAA) and the motor activity block (MAB) during sleep were obtained from actigraphic data. Non-parametric circadian rhythm activity including inter-daily stability (IS), intra-daily variability, least 5 average, most 10 average and relative amplitude were analyzed. In addition, we obtained the REM sleep behavior disorder questionnaire for the previous 3-month period (RBDQ-3M) and of the Clinical Global Impression-Improvement scale (CGI-I).

Results: Four of 7 patients had good compliance of PAP usage (average usage > 4 hr during sleep), and three patients had poor compliance of PAP usage. In good compliance group, score of RBD-3M decreased ($p=0.029$) and value of IS were increased ($p=0.029$) significantly. Also, 3 of 4 patients answered "Very much improved or much improved" in a questionnaire of CGI. In poor compliance group, there was no any significant change in all values. In addition, only one patient answered "much improved" and two patients answered "minimally improved" in CGI.

Conclusion: The PAP treatment of OSA in iRBD can be role as a lifestyle modifier that improves circadian rest-activity patterns and, it may be of value as a disease-modifying effect of behavioral or lifestyle changes that have been reported to be associated with decreased risk of neurodegenerative disorder. We will continue enroll the data and will investigate not only improvement of circadian rhythm, but also decreasing of motor activities during sleep after PAP therapy.

Support (if any):

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0713

LONG-TERM RESPONSE TO TONIC MOTOR ACTIVATION (TOMAC) THERAPY FOR REFRACTORY RESTLESS LEGS SYNDROME

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Introduction: There is a large population of patients who have become refractory to first-line treatments for Restless Legs Syndrome, partially due to augmentation to dopamine agonist medications. For patients with refractory RLS, tonic motor activation (TOMAC) is a noninvasive medical device therapy with promising short-term safety and efficacy. Here, we evaluated the response to TOMAC over a longer duration of >24 weeks.

Methods: In the RESTFUL study, 133 patients with primary moderate-severe refractory RLS were 1:1 randomized to TOMAC or sham control for weeks 1 to 4 followed by open-label TOMAC for weeks 5 to 8. The final 50 participants to complete the RESTFUL study were invited to continue TOMAC treatment for an additional 24 weeks (weeks 9 to 32) in an extension study. Participants were instructed to self-administer one 30-minute TOMAC session bilaterally over the peroneal nerve whenever RLS symptoms presented. Efficacy was assessed by comparing responses from baseline (RESTFUL study entry, week 0) to week 32 on Clinician Global Impressions-Improvement (CGI-I) responder rate, Patient Global Impressions-Improvement (PGI-I) responder rate, and International RLS Study Group Rating Scale (IRLS) total score. Additional analyses compared responses from week 8 (RESTFUL study completion) to week 32.

Results: Of the 50 eligible participants, 44 consented to the extension study and 42 completed. CGI-I responder rate relative to baseline increased from 64% at week 8 to 76% at week 32. PGI-I responder rate relative to baseline increased from 68% at week 8 to 77% at week 32. IRLS total score reduced from 24.5 at baseline to 17.1 at week 8 to 12.9 at week 32, a reduction of 11.6 points from baseline to week 32. There were no moderate or severe device-related AEs.

Conclusion: TOMAC resulted in substantial and clinically significant reduction in RLS symptom severity that was maintained through >24 weeks of treatment. Furthermore, there was a trend towards increased efficacy with continued use of TOMAC. These data suggest that TOMAC could represent a potential long-term treatment for the chronic condition of refractory RLS.

Support (if any): Funding was provided by Noctrix Health, Inc.

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0714

MACHINE LEARNING MODEL FOR PREDICTING PHENOCONVERSION IN PATIENTS WITH REM BEHAVIOR DISORDER USING CLINICAL MARKERS

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Introduction: Idiopathic Rapid eye movement (REM) sleep behavior disorder is a condition that can be an early sign of alpha-synuclein-mediated neurodegenerative diseases, and the course of the disease can vary greatly from patient to patient. It is important to identify patients who are at risk of developing neurodegenerative diseases in the future for the purpose of future clinical trials and for patients to plan their lives accordingly. Previous research has identified various risk factors for phenoconversion in RBD patients, but these studies are not practical for use in clinical settings due to resource availability or the rarity of certain features. Additionally, most of these studies have been conducted on non-Asian populations, which may have different genetic backgrounds than Asian populations. This study aimed to develop a machine learning model to predict survival in RBD patients using clinical features commonly available in routine clinical settings.

Methods: This study recruited patients diagnosed with RBD based on polysomnography results and collected 34 features for each patient. Missing data were imputed and various models were applied to the data to improve performance. The model's predictive performance was evaluated using an integrated Brier score and the concordance index. Mean performance indicators were calculated from 5-fold cross-validation results. A web application hosting the final prediction model was developed and deployed on a server for use by physicians or patients.

Results: 173 patients were included in the study. We used the likelihood ratio test to calculate the p-values of all variables and selected the following 8 variables with p-values less than 0.1: UPDRS part III, age, history of antidepressant use, history of alcohol use, MoCA (Montreal Cognitive Assessment), PSQI-TST (Pittsburgh Sleep Quality Index - total sleep time), AHI-REM (apnea-hypopnea index - REM sleep), and education level. The random survival forest model had the best mean IBS of 0.07 and the best C-index of 0.93

Conclusion: We showed that it is possible for a machine learning model to predict phenoconversion in patients with RBD using features that are commonly available in routine clinical settings

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0715

MACHINE LEARNING MODEL TO PREDICT ISOLATED REM SLEEP BEHAVIOR DISORDER PHENOCONVERSION TIME AND SUBTYPE USING EEG

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Introduction: More than 80% of patients of isolated rapid eye movement (REM) sleep behavior disorder (iRBD), a prodromal disease of α -synucleinopathies, progress to neurological disease like Parkinson's disease (PD), dementia with Lewy bodies (DLB), and multiple system atrophy (MSA). Resting-state EEG measurements taken at baseline have been related to the phenoconversion. The timing of the conversion and the disease to which it will convert are crucial issues in iRBD. This work used baseline EEG in iRBD to create a prediction model for the phenoconversion time and subtype of α -synucleinopathy.

Methods: Resting-state EEG and neurological assessments were performed at baseline on patients with iRBD. EEG spectral power, Shannon entropy and weighted phase lag index were employed as features. Four models were used to predict subtypes for the PD-MSA and DLB groups, and three models were used to predict survival. External validation was also performed.

Results: 29 patients out of 143 who were followed up to nine years (mean 3.4 years) later developed α -synucleinopathies (14 PD, 9 DLB, 6 MSA). With a concordance index of 0.8130 and an integrated Brier score of 0.0921, the random survival forest was the best model for predicting survival. For the subtype prediction analysis, the model with the highest accuracy, extreme gradient boosting, had an accuracy of 86.52%. Both models indicated a high importance on EEG slowing related features.

Conclusion: It is possible to predict the timing and subtype of phenoconversion in iRBD using machine learning models of using EEG biomarkers. To confirm our findings, further study is required, including large sample data from various countries.

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0716

QUALITY OF LIFE IN IDIOPATHIC REM SLEEP BEHAVIOR DISORDER AND ISOLATED REM SLEEP WITHOUT ATONIA

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Introduction: Idiopathic rapid eye movement (REM) sleep behavior disorder (iRBD) can affect quality of life (QOL) for both patient and bed partner; isolated REM sleep without atonia (iRSWA) has been less well-studied. We aimed to investigate whether QOL changes over time in those with either iRBD or iRSWA, as well as compare these changes to one another. Additionally, we attempted to demonstrate whether certain QOL changes were associated with phenoconversion to neurodegenerative illness.

Methods: We prospectively analyzed data from the "REM Sleep Behavior Disorder Associations with Parkinson's Disease Study (RAPiDS)" cohort both at baseline and then at follow-up

evaluations. We utilized the Neuro-QOL self-reported questionnaire to ascertain subjects' level of QOL.

Results: There were 6 with iRSWA and 33 with iRBD, with an average age of 61.9 ± 13.0 years, with 13 women and 26 men. Significant QOL changes were found in both iRSWA and iRBD group. Among those who phenoconverted, fatigue and social functioning were the main QOL issues that worsened over time.

Conclusion: This is the first time the Neuro-QOL has been studied in iRBD and iRSWA. QOL can be affected in both conditions; fatigue and social functioning seem to be of particular importance as they may be associated with phenoconversion.

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0717

RESTLESS SLEEP ASSOCIATED WITH LOW FERRITIN LEVELS: A RETROSPECTIVE STUDY IN A PEDIATRIC SLEEP CENTER

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Introduction: A significant challenge in diagnosing Restless Leg Syndrome in children is the child's inability to verbally describe their symptoms. In our pediatric sleep clinic, it has been recognized that restless sleep is a routine element of the clinical history for children presenting with a wide range of sleep disturbances. A literature review showed substantial literature about the prevalence and characteristics of restless sleep in children, but there is little showing the effect of ferrous sulfate on symptoms in children. A deficiency of brain iron stores results in a reduction of dopamine production and the clinical expression of RLS. Brain iron stores cannot be directly quantified for clinical purposes but can be evaluated indirectly by measuring serum ferritin. In the clinical framework of RLS, it is generally accepted that a serum ferritin < 50 ng/ml is too low, despite still being considered within normal range for most reference labs and replacing this with oral elemental iron should be considered the first line treatment.

Methods: A retrospective chart review was performed of patients seen in the Sleep Clinic at Arkansas Children's Hospital from 2018-2021 who had a report of restless sleep and a serum ferritin drawn. If the ferritin was lower than 50 ng/ml, they were treated with ferrous sulfate for a minimum of three months. After three months, patient's symptoms were reevaluated, and ferritin levels drawn to determine if improvement had occurred.

Results: In total, 1,000 charts were reviewed. Ferritin levels < 50 ng/ml were found in 75.2% of the patients. Of the patients with a serum ferritin > 50 ng/ml after treatment with ferrous sulfate, 62.8% reported an improvement in restless sleep and 37.2% reported no change in symptoms.

Conclusion: Low ferritin levels were found in a large number of our pediatric patients with restless sleep. The administration of ferrous sulfate in the patient population showed an improvement in symptoms of restless sleep in a majority of patients.

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0718

SLEEP-RELATED NECK MYOCLONUS CLINICAL CHARACTERISTICS: A CASE SERIES

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Introduction: Sleep-related neck myoclonus is an involuntary, brief muscular contraction of the neck that occurs during Rapid Eye Movement (REM) stage sleep. Neck myoclonus has been suggested to be a normal physiological phenomenon with unclear clinical significance; however, at times, these movements may cause symptoms, especially at high rates. We describe a series of 6 cases of patients with neck myoclonus in REM sleep and studied metrics of their polysomnograms (PSGs) to assess for any possible associations.

Methods: We assessed each patient's age, sex, sleep related complaints, as well as PSG findings such as Neck Myoclonus Index (NMI), Neck Myoclonus Arousal index (NMAI), Arousal Index, Periodic Limb Movements of sleep Index (PLMS Index), total Apnea Hypopnea Index (AHI), and REM AHI.

Results: There were 6 patients ranging in ages from 6 to 45 years, 4 out of 6 of which were men. Four out of six patients complained of sleep maintenance insomnia, 1 out of 6 complained of daytime headache, and none complained of abnormal movements in sleep. The NMI for the patients ranged from 9 to 51.6 and their NMAI ranged from 3 to 45. Their PLMS index ranged from 0 to 40.7, out of which 2 patients had abnormal elevations in PLMI as defined by AASM criteria. Overall arousal indices ranged from 6.3 to 18.3. Five out of 6 patients had clinically significant obstructive sleep apnea per the AASM criteria, with AHI ranging from 0.2 to 8.7 and REM AHI 0.8 to 11.2.

Conclusion: Though historically sleep-related neck myoclonus has been considered a normal physiological process, suggestions have been made to find a pathological cut off to better define the relationship between the frequency of neck myoclonus and other REM sleep disorders. Despite our 6 patients having frequent sleep-related neck myoclonus, this remains of unclear clinical significance as 5 out of 6 were also found to have clinically significant obstructive sleep apnea and 2 out of 6 had abnormally elevated PLMS Index. Co-morbidities need to be taken into account as well. Hence, this supports the necessity of defining a pathological cut off for a neck myoclonus index to better understand its significance.

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0719

ASSOCIATION OF SUBJECTIVE-OBJECTIVE DISCREPANCY IN SLEEP DURATION WITH ALL-CAUSE MORTALITY IN COMMUNITY-DWELLING OLDER MEN

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Introduction: There is evidence for a mismatch between subjective and objective sleep durations not only in individuals with insomnia but also in healthy individuals. However, it is unclear how such discrepancy impacts long-term health outcomes. This study investigated whether and how the discrepancy between subjective and objective sleep duration affected all-cause mortality in a sample of community-dwelling older adult men, aged ≥ 65 years.

Methods: We conducted a secondary analysis of data obtained via the Osteoporotic Fractures in Men Sleep Study, a community-based, longitudinal, observational, and multicenter study. We included data from 2,674 individuals who underwent an in-home polysomnography, completed morning surveys to assess subjective sleep duration during the polysomnography, and for whom survival or death data were available. We assessed the longitudinal association between misperception index (MI), calculated as $MI = (\text{objective sleep duration} - \text{subjective sleep duration}) / \text{objective sleep duration}$, and all-cause mortality. MI was treated as both a continuous and categorical predictor: the lowest (≤ -0.19 ; the overestimation of sleep duration) and highest MI quartiles (> 0.08 ; the underestimation of sleep duration) were compared to the interquartile range of MI ($-0.19 < \leq 0.08$).

Results: During the follow-up with a mean (standard deviation) of 10.8 (4.2) years, 1,596 deaths (59.7%) were observed. As a continuous variable, MI showed a negative association with all-cause mortality after adjusting for multiple covariates, including polysomnography-measured objective sleep duration (fully adjusted hazard ratio [HR], 0.69; 95% confidence interval [CI], 0.56–0.84). As a categorical variable, the lowest MI quartile (vs. the interquartile MI range) was associated with increased mortality (fully adjusted HR, 1.28; 95% CI, 1.12–1.46), whereas the highest MI quartile was not associated with mortality (fully adjusted HR, 0.97; 95% CI, 0.85–1.11).

Conclusion: The subjective overestimation (“reverse” misperception) of sleep duration, may be a risk factor for all-cause mortality in older men. Further investigations are needed to examine physiological mechanisms through which subjective overestimation of sleep duration leads to negative long-term health outcomes.

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0720

DEPRESSION AND PAIN ARE BARRIERS TO BENZODIAZEPINE AND Z-DRUG DEPRESCRIBING

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Introduction: Clinical guidelines recommend avoiding benzodiazepines and z-drugs (BZRAs) in older adults due to an increased risk of adverse outcomes (e.g., falls) in this population. Efforts to reduce BZRA use among older adults are growing, yet long-term BZRA deprescribing among patients with insomnia is challenging. We examined whether clinical conditions commonly comorbid with insomnia (i.e., depression, pain, nightmares, and anxiety) are barriers to BZRA deprescribing.

Methods: In an ongoing multi-site trial comparing two BZRA deprescribing programs (both include cognitive behavioral treatments for insomnia), participants aged ≥ 55 years with chronic BZRA use for insomnia ($N=165$, mean age 68.7, sd 7.9) completed baseline Patient Health Questionnaire-9 (PHQ-9), Brief Pain Inventory (BPI), Disturbing Dreams and Nightmare Severity Index (DDNSI), and Generalized Anxiety Disorder-7 (GAD-7). Deprescribing outcomes (discontinuation, dose, and frequency of use over 7-days) were assessed 1 week and 6 months after completing the deprescribing program. Using logistic and linear regression models, we assessed whether depression, pain severity, nightmare severity, and anxiety were predictors of BZRA deprescribing outcomes, controlling for site, gender, and age.

Results: Among participants assessed 1 week ($n=133$) and 6 months ($n=106$) after intervention, 77% and 66% discontinued their BZRA use, respectively. Worse PHQ-9 was associated with reduced odds of discontinuation (OR 0.88, 95% CI 0.79-0.99, $p=.027$) at 6 months, but not frequency of use or dose at follow up. Pain severity predicted more frequent use ($b=0.26$, $p=.02$) and higher dose ($b=0.94$, $p=.016$) but not discontinuation at 6 months. DDNSI (p values $\geq .068$) and GAD-7 (p values ≥ 0.15) were not significant predictors of discontinuation, frequency, or dose at follow-up.

Conclusion: More severe depression at baseline is a predictor of BZRA deprescribing failure long-term. Pain is also a barrier to BZRA reduction efforts. Programs aimed at reducing and discontinuing BZRAs used for insomnia should consider interventions that not only address underlying insomnia, but also depression and pain.

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0721**POWER NAP OR COGNITIVE TRAP? ROLE OF AGE IN ASSOCIATIONS BETWEEN NAPPING AND COGNITION**Lauren Nowakowski¹, Amy Costa², Christina McCrae³, Ashley Curtis⁴¹ University of Missouri Columbia School of Medicine,² University of Missouri - Columbia, ³ University of South Florida,⁴ University of Missouri Columbia

Introduction: How napping is associated with cognition is currently unclear with past work indicating napping benefits cognition for young adults and inconsistent findings regarding cognition in older adults. The present study improved upon previous literature by examining how age moderates associations between napping behaviors across a full week and both subjective and objective cognition across the adult lifespan.

Methods: Cognitively healthy adults aged 18-82 (N=134, Mage=41.43, SD=22.14, 115 females) completed assessments of napping habits across 7 days (naps per week, duration), and subjective cognition [Cognitive Failures Questionnaire (CFQ) total, sub-scores of CFQ-memory, CFQ-distractibility, and CFQ-blunders]. A sub-set of participants (N=105) also completed objective cognitive tasks: Stroop (inhibition, attention, processing speed), Posner Cueing (attentional orienting), Sternberg (working memory), and Wisconsin Card Sorting (executive function). Multiple regression and Johnson-Neyman analyses evaluated the moderating impact of age on associations between napping and cognition, controlling for sex, anxiety and depression symptoms, and sleep and pain medication usage.

Results: Age moderated the relationship between nap duration and CFQ-total (R^2 -change=.02, p =.04), CFQ-memory (R^2 -change=.04, p =.01), and CFQ-blunders (R^2 -change=.06, p =.01). Specifically, longer nap duration was associated with fewer global cognitive complaints at age 20 and below (B =-.08, SE =.04, p =.049), more memory complaints at age 69 and above (B =.08, SE =.04, p =.05), as well as more blunder complaints at age 47 and above (B =.05, SE =.02, p =.048).

Conclusion: Findings suggest longer naps are associated with worse subjective cognition in older adults and better subjective cognition in younger adults. Similar patterns were not observed in middle-aged adults or for objective cognition. More work is needed to understand how the potential cognitive restorative impact of napping in younger adults may be disrupted in older adults. Given known associations between subjective cognition and future cognitive impairment, prospective studies should determine if napping is a key indicator of potential future cognitive decline in aging adults and explore underlying age-related mechanisms in this relationship such as systemic inflammation and changes in

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0722**SLEEP DISTURBANCES AND SUBSEQUENT MOBILITY DISABILITY IN CHRONIC DISEASE: FINDINGS FROM THE NURSES' HEALTH STUDY**Daniel Whibley¹, Monica Shieu¹, Galit Dunietz¹, Tiffany Braley¹¹ University of Michigan

Introduction: Impaired mobility is the leading cause of disability in the U.S. Across chronic neurological, metabolic, and musculoskeletal conditions, mobility reductions are observed beyond expected effects of aging. Poor sleep health may be one common factor that drives accelerated reduction in mobility among people with chronic conditions. This study compared longitudinal associations between self-reported sleep disturbances and mobility disability progression among women with and without multiple sclerosis (MS), diabetes, and osteoarthritis (OA).

Methods: This prospective cohort study used data from four waves of the Nurses' Health Study (2008, 2012, 2014, 2016). Logistic regression and the Kaplan-Meier method were used to quantify associations between baseline sleep-related variables and subsequent increase in mobility disability.

Results: Of 70,303 women (mean age 73), 392 had MS, 7,302 had diabetes, and 24,099 had OA. Between 2008-2016, mobility disability increased in 16.9% of the sample overall, 27.8% in the MS subgroup, 27.0% in the diabetes subgroup, and 23.7% in the OA subgroup. Between 2008-2016, known/suspected OSA was significantly associated with increased mobility disability in the overall sample (OR:1.4, 95%CI:1.2,1.5), and within the diabetes (OR:1.5, 95%CI:1.2,1.9) and OA subgroups (OR:1.2, 95%CI:1.0,1.4), but not the MS subgroup (OR:2.3, 95%CI:0.6,8.9); however, across 2012-2016, this association was significant for MS (OR:4.0, 95%CI:1.0,16.1). Suboptimal sleep duration was significantly associated with increased odds of mobility disability progression in the overall sample, but not within disease subgroups. Conversely, perception of adequate sleep was significantly associated with lower odds of mobility disability progression overall (OR:0.82, 95%CI:0.78,0.87) and for the OA subgroup (OR:0.83, 95%CI:0.76,0.91). Excessive daytime sleepiness was significantly associated with mobility disability progression overall (OR:1.2, 95%CI:1.1,1.4) and for the OA subgroup (OR:1.2, 95%CI:1.0,1.4).

Conclusion: Prevalent sleep disturbances could increase risk of disability progression among women, particularly in common chronic disease populations. Informed by these data, future research could offer new insight into sleep-based strategies to ameliorate mobility decline.

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0723

SLOW WAVE ACTIVITY SURROUNDING K-COMPLEXES IS ASSOCIATED WITH LONG-TERM ALL-CAUSE MORTALITY IN A LARGE COMMUNITY-DWELLING COHORT

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Introduction: Sleep fragmentation is thought to be associated with adverse long-term consequences including mortality. However, conventional metrics of sleep fragmentation such as time spent in non-REM, REM sleep stages have been inconsistently associated with long-term consequences of sleep fragmentation. Recent studies suggest that morphological features of K-complexes might better describe sleep fragmentation as they are sensitive to effects of sleep disruption and better correlate with short-term outcomes such as daytime sleepiness. We previously demonstrated that the slow wave activity (SWA) surrounding K-complexes (Δ SWAK) was a strong predictor of sleepiness in a cohort of sleep apnea subjects, mediated in part by its association with sleep fragmentation, however its association with long-term consequences of sleep fragmentation is not well known.

Methods: We analyzed nocturnal polysomnography (NPSG) data from Sleep Heart Health Study (1995-1998), a well-characterized cohort examining the cardiovascular consequences of sleep-disordered breathing. The primary quantitative EEG (C3-A2) metrics were: SWA (%relative power in 0.5-4 Hz), K-complex density (number/min of N2), and Δ SWAK. K-complexes were detected automatically using previously published open-source method (DETOKS, Parekh et. al., 2015) during stage N2 of sleep only. All EEG metrics were divided into quartiles to explore potential non-linear associations. Death from any cause up until 2011 (mean follow up of 11 years) was the primary outcome. Cox-regression models were used to assess the relationship between EEG metrics and all-cause mortality.

Results: After accounting for missing data, 3,909 NPSG's with at least 6h of usable EEG were available for analysis (age=64 $\pm$ 11 yrs., 53.4% female). In multivariate Cox-regression models adjusted for age, gender, race, severity of sleep apnea, total sleep time, time spent in stage N2, and smoking, all-cause mortality was significantly associated with the highest quartile of SWA (HR_{q4}=0.77 [0.6-0.9], p=0.01), highest two quartiles of Δ SWAK (HR_{q3}=0.8 [0.6-0.9], p=0.04; HR_{q4}=0.6 [0.5-0.8], p<0.001).

Conclusion: Quantitative EEG measures predict mortality in a large community-dwelling cohort. Specifically, slow-wave activity surrounding K-complexes appear to be strongly associated with all-cause mortality beyond the effect of known covariates. Combined with our previous studies, our data suggest that slow-wave specific EEG measures are predictive of short- and long-term consequences of sleep fragmentation.

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0724

OBJECTIVELY REGULAR SLEEP OF OPTIMAL DURATION AND MORTALITY: THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS

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Introduction: Irregularly timed sleep, inconsistent duration, and non-optimal sleep duration have been implicated in the etiology of cardiovascular disease and premature mortality. These dimensions of sleep map behaviorally to regular bed and wake times. Our aim was to estimate the association of regular sleep of optimal sleep duration with all-cause mortality in a diverse US sample.

Methods: We used data from the Multi-Ethnic Study of Atherosclerosis Sleep Study (2010-2013) at Exam 5. Sleep was measured by 7-day wrist actigraphy, concurrent with at-home polysomnography and validated sleep questionnaires. We used K-means clustering on wrist-actigraphy regularity and duration data to assign individuals to categories of 'regular-optimal' or 'irregular-insufficient' sleep, labels describing sleep tendencies in each group. Using proportional hazard models with multi-variate adjustment for socio-demographics (age, female sex, race/ethnicity, marital status, and day vs non-day work schedules), lifestyle (moderate-vigorous physical activity, smoke status), health status (depressive symptoms, body mass index, total medications, prevalent cardiovascular disease), and measures of major sleep disorders (the Apnea-Hypopnea Index, insomnia severity, restless legs), we estimated all-cause mortality associations with sleep patterns. Sensitivity analyses additionally adjusted or, via propensity scores, matched on income, education, prevalent chronic lung disease, prevalent cancer, hypertension, diabetes, and diet.

Results: Among 1,726 participants who were followed for a median of 7.0 years (Q1-Q3, 6.4-7.4 years,) there were 171 deaths. The 'regular-optimal' group had 42% lower mortality risk compared to the 'irregular-insufficient' sleep group (Hazard Ratio [95% Confidence Interval]: 0.58 [0.43, 0.80]), in the fully adjusted model and was robust to sensitivity analyses.

Conclusion: Individuals characterized by a sleep pattern of 'regular and optimal' duration sleep had significantly lower mortality compared to those with an 'irregular and less sufficient' sleep pattern. The regular and optimal duration phenotype maps behaviorally to regular bed and wake times, suggesting potential health benefits of adherence to recommended sleep practices.

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0725

SELF-REPORTED SLEEP QUALITY AND SLEEP ARCHITECTURE ARE ASSOCIATED WITH PLASMA NEUROFILAMENT LIGHT IN OLDER ADULTS WITHOUT DEMENTIA

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Introduction: Sleep disruption is common in older adults with multiple chronic conditions and can occur before the clinical onset of Alzheimer's disease (AD). Sleep disruption plays an important role in AD pathology and has been associated with neuro-imaging evidence of AD, and cerebrospinal fluid elevations of amyloid, tau, and neurodegeneration (ATN) biomarkers. Plasma ATN biomarkers are increasingly used in AD research. We examined the associations of self-reported sleep quality and electroencephalogram (EEG) sleep architecture with plasma ATN biomarkers in sedentary older adults without dementia.

Methods: We used baseline data from an ongoing randomized controlled trial that examines the effect of physical activity on sleep and cognition in community-dwelling sedentary older adults without dementia (Montreal Cognitive Assessment [MoCA]>17, n=102). Participants reported demographics, completed the Pittsburgh Sleep Quality Index (PSQI) questionnaire, and provided blood samples to measure plasma ATN biomarkers [amyloid-beta (A β)42/42, total-tau (T-tau), and neurofilament light (NFL)]. Two-night home-based sleep EEG measures (Sleep Profiler) were collected from 56 of the 102 participants. Multiple regression models were conducted to test the associations between sleep measures and plasma ATN biomarkers.

Results: Participants were aged 69.9 ± 6.0 years, 80% were women, and they had 3.1 ± 1.7 chronic conditions. Most had intact cognitive function (68.6% MoCA ≥ 26) and 28.6% of the sample had mild cognitive impairment ($17 < \text{MoCA} < 25$). In models adjusted for age, sex, race, education, and number of comorbidities, higher PSQI scores ($\beta=0.84$, 95% confident interval (CI)= [0.12, 1.62]), longer non-rapid eye movement (NREM) N3 duration ($\beta=4.43$, 95% CI= [0.48, 8.18]), and higher REM latency ($\beta=0.04$, 95% CI= [0.02, 0.05]) were associated with higher NFL. Longer REM sleep duration ($\beta=-11.13$, 95% CI= [-20.55, -1.71]) was associated with lower NFL. There were no other significant associations of sleep measures with other ATN biomarkers.

Conclusion: Self-reported sleep quality and sleep architecture were associated with plasma NFL among older adults with intact cognition and mild cognitive impairment. Plasma NFL may be a sensitive and promising biomarker that links sleep disruption and AD-related outcomes in older adults without dementia. Future research with a larger sample is needed to further test this association.

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0726

AGREEMENT BETWEEN AN ELECTROENCEPHALOGRAPHY-MEASURING HEADBAND AND POLYSOMNOGRAPHY IN OLDER ADULTS WITH SLEEP DISTURBANCES

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Introduction: Polysomnography (PSG) is the gold standard for objective sleep measurement but may not reflect habitual sleep patterns, especially in older adults with sleep disturbances. We compared measurements from an electroencephalography (EEG)-measuring headband, averaged over seven nights, to one night of home-based polysomnography.

Methods: In a prospective, observational study among 33 community-living adults ≥ 65 years reporting symptoms of insomnia and/or daytime sleepiness $\geq$ once/week, we collected objective measures of total sleep time [TST], sleep latency [SOL], wake after sleep onset [WASO], and sleep efficiency [SE] from an EEG-headband (Dreem; Paris, France) and home-based PSG (NOX-A1 Sleep System; Reykjavik, Iceland). Measures from the EEG-headband were averaged over seven days and compared to measures from one night of PSG. Pearson correlation coefficients compared agreement between the EEG-headband and PSG for TST, SOL, WASO, and SE. Two-sample paired T-tests examined mean differences within subjects for TST, SOL, WASO, and SE between the headband and PSG.

Results: The mean age was 75 (± 6) years, 76% were women, mean scores for the Epworth Sleepiness Scale and Insomnia Severity Index were 6 (± 4) and 13 (± 4), respectively, and the mean AHI was 19 (± 16) events/hr. Correlations for TST, SOL, WASO, and SE between the EEG-headband and PSG were 0.58, 0.51, 0.48, and 0.64, respectively (p values < 0.01). On average, EEG-headband values for objective sleep measures were lower than PSG values. The mean differences for the EEG-headband and PSG within subjects for TST, SOL, WASO, and SE were 25 minutes (p=0.04), 15 minutes (p=0.06), 3 minutes (p=0.74), and 5 percent (p=0.02), respectively.

Conclusion: Among community-dwelling older adults with insomnia and daytime sleepiness, objective sleep measures from an EEG-headband, averaged over a week, were moderately correlated with values from one night of home-based PSG. While further validation of the EEG-headband is needed, these results suggest it may be inappropriate to infer habitual sleep patterns from PSG measures in older adults with sleep disturbances.

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0727**ASSOCIATION OF SLEEP QUALITY WITH MEMORY FUNCTIONS AMONG DEMENTIA-FREE, MIDDLE- AND OLDER-AGE, RURAL INDIANS**Jonas Sundarakumar¹, Pooja Rai¹, Divya NM¹, Thomas Issac¹¹ Centre for Brain Research, Indian Institute of Science, Bangalore

Introduction: Sleep is known to be involved in cognitive processes, such as memory consolidation. Poor sleep is a potential risk factor for dementia. However, whether it is associated with decreased memory functions among dementia-free individuals is not well known. This study aims to investigate the effect of sleep quality on memory functions among middle and older-age adults from a rural Indian population.

Methods: Participants were dementia-free, rural Indians (≥ 45 years) recruited as part of an ongoing, prospective, aging cohort study, namely Srinivaspura Aging, NeuroSenescence, and COGNition (SANSOCG) study. Cross-sectional (baseline) data on sleep quality was obtained using Pittsburgh Sleep Quality Index (PSQI). Memory functions (at baseline) were assessed using subtests, namely immediate recall, delayed recall, name-face association, semantic fluency, phonemic fluency, and semantic association, from a culturally validated computerized neurocognitive test battery. Clinical Dementia Rating (CDR) was used to classify subjects based on their cognitive status into cognitively healthy (CDR=0) and MCI (CDR=0.5). Linear regression models, unadjusted and adjusted with cognitive status, age, gender, and depression, were used for analysis.

Results: In the unadjusted linear regression model 1, we found no association between sleep quality and the different subtests of memory. However, in model 2 (adjusting for cognitive status), sleep quality in persons with MCI was significantly associated with memory functions. Model 3 (model 2 + age) found that sleep quality in higher ages in MCI explained a significant variance in the association between sleep and subtests of memory function compared to cognitively healthy individuals. Model 4 (model 3 + gender) suggested that with increasing age, gender was significantly associated with sleep quality and memory among individuals with MCI compared to cognitively healthy individuals. Further, model 5 (model 4+ depression) found that depressed individuals with MCI showed a significant association between sleep quality and memory functions compared to those without depression.

Conclusion: When adjusted for cognitive status, age, gender and depression, there was significant association of sleep quality and memory functions, pointing to the important role of sleep in memory functions among middle and older-aged individuals without dementia.

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0728**DOES SHORT SLEEP DURATION INCREASE RISK FOR POSTPARTUM WEIGHT RETENTION?**Jeanna Ryan¹, Heather Day¹, Marlene Egger¹, Christopher Depner¹, Janet Shaw¹¹ University of Utah

Introduction: About 75% of mothers in the United States have postpartum weight retention (PWR), which increases risk for

adverse health outcomes in mother and child. Short sleep duration is an important health behavior linked to risk of weight gain in the general population. Although short sleep duration is common in postpartum, findings from the few studies examining sleep duration and PWR are mixed. Thus, we aimed to examine whether sleep duration at 6 months postpartum is associated with PWR at 12 months. We also explored agreement between self-reported and actigraphy-derived sleep duration.

Methods: This is a secondary analysis from a prospective cohort study investigating postpartum pelvic floor outcomes. Participants were healthy, age ≥ 18 years, and primiparous with a singleton birth. We measured sleep duration by triaxial, wrist accelerometer (Actigraph GT3X+) and by self-report using the Pittsburgh Sleep Quality Index (PSQI). Excessive PWR was defined as $\geq 7\%$ of pre-pregnancy weight. Log-binomial regression assessed the relationship between sleep duration and PWR, adjusted for pre-pregnancy body mass index, gestational weight gain, and breastfeeding. We analyzed agreement between self-reported and actigraphy-derived sleep duration using Bland-Altman analysis and paired t-test.

Results: Participants ($N=467$; mean age= 29.5 ± 4.78 years; pre-pregnancy BMI= 24.4 ± 5.03 kg/m²) were mostly White (91%) and educated (93%). After adjustment, sleep duration by actigraphy (Risk Ratio (RR)=0.96, 95% confidence interval (CI)=(0.87,1.06), $p=0.44$), and by PSQI (RR=0.95, 95%CI=(0.84,1.07), $p=0.38$) was not associated with PWR. There was a statistically significant correlation between sleep duration by actigraphy and by PSQI ($r=0.19$, 95% CI=(0.10,0.28), $p<0.001$). The limits of agreement were wide (-3.41 to 3.57 hours), and self-reported versus actigraphy-derived sleep duration was not statistically different (bias=0.08 hours, $p=0.3313$) indicating no pattern of underestimating or overestimating.

Conclusion: In contrast to some previous findings, sleep duration at 6 months postpartum was not associated with PWR at 12 months. The assessment of additional sleep dimensions, such as timing or efficiency, may further refine our understanding of how sleep affects PWR. Self-reported and actigraphy-derived measures of sleep duration evidenced wide discrepancies in postpartum women, suggesting that the method of sleep measurement may contribute to mixed findings related to sleep in this population.

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0729**GRANDPARENTS RAISING GRANDCHILDREN: DOES CAREGIVING STATUS MODERATE THE RELATIONSHIP BETWEEN STRESS AND SLEEP**Melanie Stearns¹, Kevin McGovney², Ashley Curtis³, Soomi Lee¹, William Haley¹, Laura Szalacha¹, Christina McCrae¹¹ University of South Florida, ² University of Missouri - Columbia,³ University of Missouri Columbia

Introduction: The close relationship between high stress and poor sleep is well known. Less is known whether this relationship is stronger for a certain population group who may experience more stress. Grandparents responsible for raising their grandchildren are such a vulnerable group, as increased caregiving responsibilities are associated with increased stress levels. To test this hypothesis, we examined whether grandparent caregiving status moderated the relationship between subjective stress and sleep.

Methods: The sample was a subset of individuals recruited in the second wave of the MIDUS biomarkers project completed in 2009 who answered the sleep, caregiving, and stress variables of interest. Participants included grandparents who reported having been responsible for the care of their grandchildren for at least 1 year ($N=63$, age $M=61.80$, 64% female) and grandparents who were not responsible for their grandchildren ($N=423$, age $M=62.98$, 56.2% female). Multiple regressions (SPSS PROCESS) examined whether caregiving status (1=yes, 0=no) moderated associations between subjective stress (Perceived Stress Scale) and sleep (subjective Sleep Onset Latency-SOL and sleep quality) over the past month. Analyses controlled for age and gender.

Results: Caregiving status interacted with stress ($t(1, 484)=3.81$, $p=.04$) in its association with SOL ($R^2=.15$, $p=.001$). Specifically, increased stress was associated with greater SOL in caregiving grandparents and to a lesser (but not significant) extent in non-caregiving grandparents ($Z=1.49$, $p=.13$). Caregiving status interacted with stress ($t(1, 484)=5.76$, $p=.02$) in its association with sleep quality ($R^2=.33$, $p<.001$). Specifically, increased stress was associated with worse sleep quality in caregiving grandparents and to a less extent in non-caregiving grandparents ($Z=2.67$, $p=.01$).

Conclusion: These results suggest that caregiving status may contribute to an increase in the positive relationship between subjective stress and sleep problems. Future research should utilize longitudinal and experimental methodology to determine the causality of these relationships as well as examine physiological measures of stress. In addition, studies should investigate whether addressing stress in behavioral sleep treatments may improve caregiving grandparents' sleep.

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0730

POLYSOMNOGRAPHIC CHARACTERISTICS AMONG TRANSGENDER ADULTS; INFLUENCE OF GENDER-AFFIRMING HORMONE THERAPY

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Introduction: Gender differences in polysomnographic characteristics (PC) among cisgender people may be influenced by gonadal hormones. Data on PC among transgender people (TP) receiving or not gender-affirming hormone therapy (GAHT) is sparse. This study aimed to describe PC among TP and explore associations between gender identity (GI), GAHT, and PC.

Methods: This cross-sectional study identified TP at a large academic sleep medicine center through medical record review. We included TP aged ≥ 18 years with available polysomnography data. The sample was stratified by GI (transfeminine and transmasculine) and further classified by GAHT use. Descriptive statistics were calculated for GI and GAHT groups. Linear regression models adjusted for age, obstructive sleep apnea, and depression diagnoses were utilized to examine associations between GI, GAHT, and PC (total sleep time [TST], sleep onset latency, rapid eye movement sleep latency [REMSL], arousal index, wake after sleep onset [WASO], sleep stage rapid eye movement [REM], non-REM [N] 1, 2, and 3 percentage, sleep efficiency, and periodic limb movement index [PLMI]).

Results: Seventy-seven individuals met inclusion criteria. Of these, 52% were transfeminine, mean age was 39.2 ± 13.3 years, mean body mass index was 35.1 ± 9.0 Kg/m², and 56% used GAHT. Transmasculine people had significantly higher stage N3% (13.9 ± 13.6 vs $7.7 \pm 10.0\%$), and lower PLMI (3.5 ± 5.8 vs $10.6 \pm 18.6/h$) compared to transfeminine participants. Among transmasculine people, REMSL was shorter in participants using GAHT compared to those not on GAHT (145.0 ± 66.9 vs 217.1 ± 104.1 minutes). In transfeminine people, stage N3% and REMSL were increased in those on GAHT compared to individuals not on GAHT (10.6 ± 11.5 vs $4.9 \pm 7.7\%$; 214.8 ± 126.9 vs 133.6 ± 85.5 minutes, respectively), although not statistically significant. Adjusted analysis showed associations between transmasculine identity and decreased TST ($\beta=-42.8$, 95% CI [-84.7, -0.9] minutes), feminizing GAHT use and longer REMSL ($\beta=84.2$, 95% CI [0.1, 168.4] minutes), and suggested decreased REMSL and WASO with masculinizing GAHT use ($\beta=-59.4$, 95% CI [-134.2, 15.3]; $\beta=-28.7$, 95% CI [-72.5, 15.0] minutes respectively).

Conclusion: This report highlights differential associations between GI, GAHT, and PC in TP. Despite some enhanced PC, transmasculine identity significantly decreased TST. In addition, feminizing GAHT contributed to mixed PC outcomes, while masculinizing GAHT appeared to improve them.

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0731

SALIVARY CORTISOL AND SLEEP IN GRANDPARENTS RAISING GRANDCHILDREN AND NON-CAREGIVING GRANDPARENTS

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Introduction: Caregivers often exhibit unhealthy/dampened cortisol profiles and sleep problems due to high stress. Grandparent caregivers (GP-CG) may be particularly vulnerable with caregiving burden and age-related changes in sleep/health. Yet there is lack of empirical evidence examining baseline cortisol and reactivity in GP-CG and how they are associated with sleep. We examined differences between GP-CG and non-GP-CG in cortisol levels pre- and post-stress tasks and the moderating role of caregiving status in the relationship between cortisol and sleep.

Methods: 486 participants in the second wave of the 2009 MIDUS biomarkers project were characterized as GP-CG who cared for their grandchild for at least 1 year ($n=63$, $M_{age}=61.80$, 64% female) and non-GP-CG ($n=423$, $M_{age}=62.98$, 56.2% female). T-tests and multiple regressions (SPSS PROCESS) examined group differences and moderation by caregiving status in the associations between salivary cortisol (Salivette®; measured before and after Stroop and MATHTurner tasks) and sleep (work-day and non-work-day total sleep time-TST; frequency of Sleep Onset Latency problems-SOLfreq; 1-never to 5-always) over the past month. Analyses controlled for age, gender, cortisol collection time.

Results: GP-CG had lower baseline cortisol ($M=10.35$, $SD=6.02$) than non-GP-CG ($M=12.15$, $SD=7.70$; $t(485)=2.03$, $p=.045$). GP-CG had lower post-task cortisol reactivity ($M=10.99$, $SD=5.83$) than non-GP-CG ($M=13.21$, $SD=7.73$; $t(485)=2.06$,

$p=.040$). Only non-GP-CG had a significant cortisol increase from baseline to post-task ($t(1,422)=3.00$, $p=.001$). Caregiving status interacted with baseline cortisol ($t(1, 484)=3.81$, $p=.04$) in its association with SOLfreq ($R^2=.16$, $p=.03$). Higher baseline cortisol was associated with less SOLfreq in GP-CG with no relationship in non-GP-CG. Additionally, caregiving status interacted with post-task cortisol ($t(1,484)=7.79$, $p=.006$) in its association with non-work-day TST ($R^2=.17$, $p=.04$). Cortisol and TST had a positive relationship in GP-CG but a negative relationship in non-GP-CG.

Conclusion: GP-CG may have lower baseline cortisol and reactivity compared to non-GP-CG, consistent with previous literature examining individuals with prolonged stress compared to healthy controls. GP-CG's reduced cortisol reactivity may be adaptive given that the positive relationship between cortisol and sleep in this group, contrary to the negative association found among healthy controls. Future research should utilize longitudinal data to determine the temporality of these relationships.

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0732

SLEEP MULTI-TRAJECTORIES OF COUPLES UP TO 36 MONTHS POSTPARTUM AND THEIR COVARIATES: THE SEPAGES COHORT STUDY

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Introduction: Parents reported degraded sleep outcomes up to several years after child birth. Most published studies were cross-sectional, in early post-partum and focusing on maternal-child dyads. We aimed at identifying sleep multi-trajectories (SMT) including night (NSD) and daytime (DSD) sleep duration and subjective sleep loss (SSL) between 3 and 36 months postpartum in couples from the SEPAGES cohort.

Methods: From 484 mothers and 410 fathers included in the SEPAGES cohort, sleep information was collected by self-reports at 3, 18, 24 and 36 months postpartum. Couple SMT were modelled using Group-Based Trajectory Modelling method. Each couple was assigned to the group of SMT with the highest probability of belonging to. Multinomial logistic regression assessed sociodemographic, parental and child covariates associated SMT

Results: Three groups SMT were identified in couple who reported sleep data at least 2 times across the 4 time-points ($N=188$). In G1 (29.3%), couples had 8-9hr of mean NSD and a stable and relatively short mean maternal and paternal DSD (≈ 10 min and ≈ 5 min, respectively) while SSL was decreasing for mother (58% to 31%) but stable for father ($\approx 30\%$) between 3 and 36 months postpartum. In G2 (27.7%), they had a stable but relatively short mean NSD (7-8hr), a maternal DSD decreasing by 20min between 3 and 18 months then being stable at 23min, a stable paternal DSD (≈ 10 min) and high but decreasing SSL from 90% to 86% for mothers and 76% to 61% for fathers. In G3 (43.0%), couples had a stable mean NSD (8-9hr), a relatively

long mean DSD, decreasing from 54 to 41min for mothers but increasing from 28 to 39min for fathers, and a stable but relatively high SSL ($\approx 70\%$ for mothers and $\approx 55\%$ for fathers). From logistic regression, belated paternal chronotype increased odds for belonging to G2 while having a first child and born in autumn decreased odds to belong to G2 compared to G1.

Conclusion: We identified 3 different SMT between 3 and 36 months postpartum for the first time. We found several factors associated with each SMT. Studies are still warranted to investigate further interrelation with the child sleep patterns.

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0733

THE ASSOCIATION OF NOCTURIA AND NAPPING WITH OBSTRUCTIVE SLEEP APNEA AMONG OLDER ADULTS WITH INSOMNIA AND/OR DAYTIME SLEEPINESS

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Introduction: Obstructive sleep apnea (OSA) is underdiagnosed in older adults (OAs) due to the poor performance of screening questionnaires. Symptoms of nocturia and napping may improve the identification of OSA in this population. We examined the association of these symptoms with OSA in OAs, and whether the association differed by gender.

Methods: In a prospective, observational study among 39 community-living adults ≥ 65 years reporting symptoms of insomnia and/or daytime sleepiness $\geq$ once/week, we evaluated the association of nocturia and napping with OSA. Nocturia was assessed by the self-reported average number of times getting up to urinate at night. Napping was evaluated by self-reported number of naps/week, average nap duration (in minutes), and napping minutes/week (naps/week x minutes/nap). OSA was assessed by the Apnea Hypopnea Index (AHI) from home-based polysomnography. We used Pearson correlation coefficients to examine the strength of the association of nocturia and napping with AHI among all subjects, and separately in men and women.

Results: In all participants, the mean age was 74 ± 6.8 years, 72% were women, and the mean AHI was 19 ± 15.9 events/hr. When compared to women, men reported more nocturia (1.6 vs. 1.3 episodes/night), more napping (including naps/week [3 vs. 2], nap duration [31 vs. 17 minutes], and napping minutes/week [150 vs. 55 minutes]). In addition, they had higher AHIs (25 vs. 16 events/hr). Among all participants, nocturia was not significantly correlated with AHI, while nap duration and napping minutes/week were significantly correlated with AHI (p values < 0.02). Among 11 men, nap duration and minutes per week were correlated with AHI (correlations 0.74 [$p=0.009$] and 0.56 [$p=0.07$], respectively). Among women, no napping characteristics were significantly correlated with AHI.

Conclusion: Among community-dwelling OAs with insomnia and daytime sleepiness, napping, and not nocturia, was associated with OSA. This association was driven by the strong

correlation among men, particularly for nap duration. Napping may be a good screening question for OSA in older men, but examination of other symptoms is warranted in older women.

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0734

GENDER DIFFERENCES IN US MILITARY PERSONNEL WITH INSOMNIA, OBSTRUCTIVE SLEEP APNEA & COMORBID INSOMNIA AND OBSTRUCTIVE SLEEP APNEA

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Introduction: Women constitute approximately 17% of the military. Yet, relatively little is known regarding sleep disorders and comorbid diagnoses effecting this gender. The aim of this study was to determine if there were gender-related differences in symptoms of sleep disorders and sleep-related impairment, comorbid sleep, behavioral medicine, and traumatic brain injury (TBI) diagnoses and polysomnographic (PSG) variables in military personnel with insomnia, OSA, and comorbid insomnia and OSA (COMISA).

Methods: Participants were 372 military personnel (46.2% females, 53.8% males) with an average age of 37.7±7.46 years and median BMI of 28.4 (5.50) kg/m². Based on clinical evaluation and video-PSG, participants were diagnosed with insomnia (n = 118, 71.2% female), OSA (n = 118, 28.8% female) and COMISA (n = 136, 39.7% female). Insomnia severity, excessive daytime sleepiness, sleep quality, nightmare disorder, sleep impairment, fatigue, posttraumatic stress disorder (PTSD), anxiety, depression symptoms, and traumatic brain injury (TBI) were evaluated with validated questionnaires. Descriptive statistics, parametric and non-parametric pairwise comparisons and effect-size analyses were used to assess differences between sexes in terms of variables of interest.

Results: Female service members had significantly greater symptoms of nightmare disorder, PTSD, anxiety, and depression than their male counterparts. There were no significant differences between males and females with insomnia or OSA in sleep-related symptoms, impairment, or PSG based apnea-hypopnea index (AHI). Male service members with COMISA had a significantly greater AHI; females with COMISA had significantly greater symptoms of nightmare disorder, PTSD and anxiety.

Conclusion: In the largest study to date to clinically evaluate sleep disorders in military personnel, COMISA was the most frequent diagnosis. Surprisingly, there were minimal differences in self-reported symptoms of sleep disorders and PSG characteristics. However, male servicemembers with COMISA have more severe sleep disordered breathing while female servicemembers

with COMISA have greater mental health morbidity. Military service may result in distinct sleep disorder phenotype(s).

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0735

RESTORATIVE SLEEP RESTORES SLEEP LOSS AND EXCESSIVE TIME IN BED IN MIDDLE-AGED AND OLDER ADULTS

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Introduction: Associations of sleep duration with health outcomes could differ depending on whether sleep is restorative. Age-related changes in the relationship between sleep need and sleep opportunity could also influence these associations.

Methods: Using data from 5804 participants of the Sleep Heart Health Study, a multicenter population-based prospective cohort study, we examined the longitudinal association of feeling rested after sleep combined with in-home polysomnography-measured total sleep time (TST) or time in bed (TIB) with all-cause mortality.

Results: A total of 223 (7.1%) and 991 (37.0%) deaths were reported in 3128 middle-aged (40–64 years) and 2676 older adults (≥ 65 years) with a mean (standard deviation) age of 54.5 (6.6) and 73.3 (5.7) years at baseline over a median (interquartile range) follow-up time of 12.3 (11.3–13.5) and 11.3 (8.2–12.2) years, respectively. Among middle-aged adults, compared with the interquartile TST range (331 to < 414 min) with feeling rested, the lowest TST quartile (< 331 min) with feeling unrested was associated with higher mortality (adjusted hazard ratio [aHR], 1.54; 95% confidence interval [CI] 1.01–2.33); the highest TST quartile (≥ 414 min) with feeling rested was associated with lower mortality, independently from health and sleep covariates (aHR, 0.55; 95% CI 0.32–0.97). Among older adults, TIB, but not TST, was consistently associated with mortality. Compared with the interquartile TIB range (404 to < 482 min) with feeling rested, the highest TIB quartile (≥ 482 min) with feeling unrested was associated with higher mortality (aHR, 1.57; 95% CI 1.23–2.01).

Conclusion: The results suggest the role of restorative sleep in differentiating the effects of sleep duration on mortality outcomes for middle-aged and older adults. Our findings further suggest that there is a need to change the way to optimize sleep hygiene according to age groups: in middle-aged adults maintaining a substantial amount of sleep is more critical, whereas in older adults optimizing sleep opportunity is more critical to determine the sleep–mortality relationship.

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0736

ADHERENCE TO MARIANISMO AS A MODERATOR IN THE RELATIONSHIP BETWEEN FAMILY RELATIONSHIP QUALITY AND INSOMNIA AMONG LATINA WOMEN

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Introduction: Studies have highlighted the detrimental impact of family conflict and the beneficial effects of family cohesion on insomnia. Given the Latinx cultural value of familism, which emphasizes the centrality of close, warm family relationships, the quality of family relationships may be an especially important risk or protective factor of insomnia among Latinas. Additionally, a high adherence to marianismo, the constellation of Latinx female gender expectations, may amplify the effects of family relationships on insomnia because it emphasizes the woman's responsibility in maintaining harmonious family relationships. Our aims were to (a) examine the association between family conflict, family cohesion, and insomnia severity and (b) test the moderating effects of marianismo among Latinas.

Methods: Using a subsample of cross-sectional data from Latinas participating in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) Sociocultural and Sueño ancillary studies ($n=604$), we conducted weighted, linear regression analyses to test the association among family conflict (Conflict), family cohesion (Cohesion), and insomnia severity (IS). Adjusted models controlled for age, marital status, education, and English/Spanish language preference. A final adjustment was made for depressive symptoms. We conducted moderation analyses (marianismo*Conflict; marianismo*Cohesion) in minimally and fully adjusted models. Conflict was measured using the Family Cultural Conflict subscale of the Hispanic Stress Inventory. Cohesion was measured using a subscale of the Family Environment Scale. Marianismo was operationalized as adherence to the family pillar subscale of the Bem Sex Role Inventory. We used the Insomnia Severity Index to measure IS.

Results: Participants were Mage 41.38 ($SD=13.41$). Most women were married (44.74%), earned >high school diploma (39.71%), and preferred to speak Spanish (76.03%). The mean IS score was 8.02 ($SD=6.76$). Conflict was not statistically significantly associated with IS ($SE=0.05$, $p>.05$). One SD increase in Cohesion was associated with a 0.10 decrease in IS in minimally adjusted models ($SE=0.05$, $p=0.04$), but was not statistically significant after adjusting for depressive symptoms. Marianismo did not moderate these associations.

Conclusion: Greater cohesion emerged as a robust predictor of reduced insomnia severity in one of the first large-scale studies examining the effects of sociocultural factors on Latinas' sleep. If replicated using longitudinal data, findings suggest that developing family-based interventions amplifying cohesion, rather than decreasing conflict, may be more beneficial for reducing insomnia among Latinas.

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0737

AGE, MENSTRUAL PHASE, AND CIRCADIAN PREFERENCE IMPACT SLEEP IN MENSTRUATING INDIVIDUALS

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Introduction: An eveningness chronotype is generally associated with reduced sleep continuity and quality, as well as social jet-lag. Changes in hormones and menstrual phase similarly impact sleep, although research on the chronobiological effects of these changes are equivocal. This study aimed to examine the role of menstrual cycle in daily self-report and actigraphy-assessed sleep in two consecutive menstrual cycles.

Methods: Participants ($n=51$; 43% Caucasian), 18-35 years (23.67 ± 4.68) completed actigraphy and daily sleep diaries over two menstrual cycles ($m\ days=51.29$). Four menstrual phases were identified via dates of menstrual bleeding and urinary ovulation testing: perimenstrual (± 3 days of bleeding), mid-follicular, periovulatory, and mid-luteal. Relationships between menstrual phase and sleep parameters were estimated using multistep hierarchical linear modeling. Subjective and objective measures yielded the following sleep variables: Total Wake Time (TWTsub and TWTobj), Sleep Efficiency (SEsub and SEobj), and mid-sleep point (MSP). Participants completed the Morning-Eveningness Questionnaire (MEQ) at baseline.

Results: Mean cycle length was $28.61\ days\pm2.69$. Age was significantly associated with TWTobj ($r=-.32$, $p<.001$); SEobj ($r=.34$, $p<.001$), and MSP ($r=-.42$, $p<.001$) such that older participants had shorter TWT, higher SE, and earlier MSP. TWTobj was 4-7 minutes lower during the mid-follicular (61.54 ± 3.37) and mid-luteal phases (63.11 ± 3.29) compared to the perimenstrual phase (67.54 ± 3.37 ; $p<.001$). SEobj was higher in the mid-luteal phase (82.50 ± 0.79) vs. the perimenstrual phase (80.71 ± 0.82 , $p=.006$). Perimenstrual women reported 8-16 minutes longer awake (TWTsub= 52.23 ± 5.01 , $p<.001$) and had 1-3% reduction in SEsub (89.70 ± 0.10 , $p<.001$). MEQ negatively predicted TWTobj ($p=.004$) and SEobj ($p=.003$), but did not vary across menstrual phase. In morning-type individuals, TST was significantly higher in the periovulatory ($b=1.81$, $p=.01$) and mid-luteal phases ($b=2.03$, $p<.001$) compared to the perimenstrual phase.

Conclusion: With increasing age, women experienced reduced time awake, higher sleep efficiency, and earlier sleep timing. Eveningness predicted greater total wake time and lower sleep efficiency. With menstrual phase considered, disturbed sleep was highest in the perimenstrual phase and women reporting a stronger preference for eveningness reported shorter TST during the perimenstrual phase. These findings highlight the importance of considering the menstrual cycle in the sleep health of menstruating individuals.

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0738

ASSOCIATION OF SOCIO-DEMOGRAPHIC DETERMINANTS, SMOKING, AND OBESITY WITH SLEEP TROUBLE AMONG WOMEN OF REPRODUCTIVE AGE

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Introduction: While sleep quality in women is well known to be affected by hormonal factors such as menstrual cycle, pregnancy, and postpartum period, the connections between their sleep and socio-demographic characteristics are not widely studied. Our study objective was to examine the self-reported sleep problems among women of reproductive age in the US and their association with socio-demographic determinants of health as well as other health-related factors using the National Health and Nutrition Examination Survey (NHANES).

Methods: We analyzed a secondary data with 5,610 female participants aged 15 to 49 years who participated in the NHANES conducted during 2013 – 2018 to examine for the prevalence of self-reported sleep trouble as well as socio-demographic determinants (age, ethnicity, marital status, education, and income) and the presence of smoking and obesity. A design-based F-test and survey-based generalized linear model with Poisson family and log link function were performed to estimate the adjusted and unadjusted prevalence ratio (PR) with statistical significance of associated factors.

Results: The likelihood of trouble sleeping for those in the age group of 41 to 49 were significantly higher than those in the age group of 15 to 20 (PR 1.77 [95% CI 1.14-2.77]). Significantly more minority women including non-Hispanic Asian (PR 0.46 [95% CI 0.32-0.67]), Hispanic (PR 0.63 [95% CI 0.46-0.86]), and non-Hispanic black (PR 0.73 [95% CI 0.54-0.99]) reported less likely to have trouble sleeping than non-Hispanic multiracial group. When looking at marital status, married individuals reported less trouble sleeping (PR 0.83 [95% CI 0.80-0.99]) as compared to those who never married. Smoking was also associated with more trouble sleeping (PR 1.43 [95% CI 1.27-1.61]). Prevalence of reporting trouble sleeping was significantly higher for obese women compared to those with normal weight (PR 1.25 [95% CI 1.07-1.46]). There were no statistically significant differences in reported sleep trouble based on education status and income.

Conclusion: Using the large-scale population-based cross-sectional survey analysis, we identified that the problem of sleep disturbance was independently and positively associated with the higher age, unmarried, smokers and obese women in the reproductive age group.

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0739

EFFECT OF OBSTRUCTIVE SLEEP APNEA AND INSOMNIA ON COGNITIVE IMPAIRMENT IN WORLD TRADE CENTER (WTC) RESPONDERS

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Introduction: Mild Cognitive Impairment (MCI) is defined as a noticeable decline in cognitive abilities that doesn't interfere with daily activities; MCI may be a precursor of Alzheimer's disease and related dementia. Elevated risk of MCI has been shown in subjects with obstructive sleep apnea (OSA) in a sleep clinic population and in subjects with insomnia in a general population. OSA and Insomnia both have a high prevalence among members of the World Trade Center Health Program General Responders' Cohort (WTCHP GRC). Previous research indicated they had a high prevalence of MCI but did not examine sleep. We examined the association between MCI with OSA and/or Insomnia in the WTCHP GRC.

Methods: We assessed MCI by the Montreal Cognitive Assessment (MoCA) in English (n=115) and Spanish (n=27). MoCA < 26 defines MCI. OSA defined by AHI4>=5 or RDI>=15 events/hr, was assessed by home sleep test or in-lab NPSG. A score>7 on the Insomnia Severity Index (ISI) defined insomnia. Education was categorized as < or > bachelor's (BA/BS) degree; subjects were categorized as Latino or not. Variables were analyzed using linear correlation, t-tests and chi-square tests as appropriate.

Results: The study population consisted of 142 subjects (80%M/20%F, age 58±8 years, BMI=29.7±5 kg/m², Non-Latino/White=57%, Latino/any race=35%, < BA/BS=65%). OSA prevalence was 65.5% (mean AHI4=10.8±12.5/hr and RDI=21.42±16/hr). Insomnia prevalence was 48% (ISI=8.8 + 6). 48% (n=68) of subjects were classified as MCI. No correlation was observed between MoCA and OSA severity (r=0.1, p=0.24) or ISI (r=-0.1, p=0.1). Subjects without OSA had higher MCI prevalence (MCI_OSA=21.5% vs MCI_noOSA=37%, p=0.018). Lower educational level, race/ethnicity, and language (Spanish/English) (p< 0.001) were associated with MCI.

Conclusion: In this heterogeneous cohort, we showed an unexpected lower MCI prevalence in OSA subjects. As shown by others, MCI defined by the MoCA was highly impacted by race/ethnicity, language and education. This suggests that our findings may be influenced by differences in the MoCA scoring and MCI cutoffs in Hispanic populations. To understand the relationship between MCI and sleep disorders in the WTC population, future studies should re-assess the cutoffs used in MoCA scoring or use tools to assess MCI less dependent on ethnicity and educational level.

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0740

FACTOR STRUCTURE OF SLEEP IN OLDER ADULTS DIFFERS WHEN NEARING END-OF-LIFE

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Introduction: Adults aged 65 and older in the last year of life are at risk for experiencing non-beneficial hospitalizations, adversely affecting their quality-of-life. Reasons for undesired hospitalizations include the need to manage symptoms of progressing chronic illnesses, many of which are exacerbated by poor sleep. Given the complexity of sleep, especially as end-of-life (EOL) nears, it is imperative to understand if the myriad of variables traditionally used to describe sleep can be simplified. Insight gained by such knowledge could be used to guide assessment of sleep at EOL and identification of sleep-related interventions to improve EOL care.

Methods: Exploratory factor analyses (EFAs) were performed using data from rounds of the National Health and Aging Trends Study (NHATS) that included in-depth sleep modules. One EFA was performed for individuals who died before the next round, and another for those who did not. Ten variables were considered for each EFA, and comprised sleep disorders symptoms, sleep quality, and daytime consequences.

Results: There were three unique constructs each for the died and not-died groups. Among NHATS participants who had died, sleep experience (>30 mins falling asleep, try falling back asleep, time falling back asleep, sleep hours, and quality of sleep), tiredness (difficulty staying awake, how often nap), and EOL symptoms (sleep meds, breathing, and pain) explained 47.5% of the variability in sleep (n=122). Among NHATS participants who had not died, sleep disorder symptoms (>30 mins falling asleep, try falling back asleep, time falling back asleep, sleep hours, breathing, and quality of sleep), discomfort (pain, difficulty staying awake, how often nap), and sleep medication explained 40.9% of the variability in sleep (n=124).

Conclusion: Older adults nearing the EOL have different factor structures describing their sleep than those who are not near EOL. Napping and daytime sleepiness as well as pain, medication, and breathing for sleep have important implications for those nearing EOL that could be addressed by palliative care interventions.

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0741

GENDER DIFFERENCES IN THE ASSOCIATION OF HOUSEHOLD BURDEN WITH SLEEP DISTURBANCE

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Introduction: The emotional, mental, and physical labor inherent to family and household management may help explain gender differences in insomnia. Research suggests that managing multiple roles and responsibilities within the household can lead to sleep disruption. However, the sleep consequences of acting as “household manager,” which has been shown to negatively

impact wellbeing, remains untested. The current study evaluated the association of household burden with sleep disturbance among both women and men.

Methods: Participants were recruited to complete an online survey from both the general population and the National Jewish Health Sleep Clinic. Eligibility criteria included being in a cohabitating relationship, currently employed, and having at least one child/dependent under the age of 18 residing in the household. The sample for this analysis (n = 558; mean age = 38; 62% men) had complete data on the primary measures of sleep (PROMIS Sleep Disturbance scale) and household burden (Household Management Measure; HMM). The HMM has three subscales (Household Routines, Child Adjustment, and Household Finances), with higher scores indicating greater personal responsibility. Bivariate correlations were utilized to assess the association of household burden with sleep disturbance among both men and women.

Results: Among females, increased levels of sleep disturbance were associated with higher rates of overall household burden (r(208) = .22, p < .01), as well as child (r(208) = .18, p < .05), and financial (r(208) = .22, p < .01) responsibility. Conversely, among males, lower levels of sleep disturbance were associated with higher rates of overall household burden (r(344) = -.20, p < .01), as well as household routine (r(344) = -.14, p < .01), child (r(344) = -.17, p < .01), and financial (r(344) = -.20, p < .01) responsibility.

Conclusion: The association between household burden and sleep disturbance differs between women and men. Among men, increased perceived household responsibility was associated with less sleep disturbance, while the opposite was found for women. Additional research is warranted to better understand the differing effects of household responsibility on sleep by gender.

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0742

IS SLEEP ALTERED DURING THE MENSTRUAL CYCLE? A POLYSOMNOGRAPHY STUDY FROM EPISONO

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Introduction: During the reproductive life, woman experiences changes in their hormone levels that characterize her menstrual cycle. This monthly event provides hormonal and body conditions to development of pregnancy and lactation. In addition to alterations in hormones, some women present physical and psychological complaints according to the phase of the menstrual cycle. Sleep has been reported to be deteriorated during menses; however, no conclusive results have been stated. The aim of our study was to evaluate the objective and subjective sleep during 3 different time-points of the menstrual cycle.

Methods: For this study we used the São Paulo Epidemiological Sleep Study (EPISONO) database. Ninety-one women were distributed in follicular (F) phase (N=27), luteal (L) phase (N=39) and menstruation (M, N=25) and undergone a one-night polysomnography. Blood samples and women's questionnaire data were collected to investigate hormonal levels and information about the menstrual cycle to identify the phase of the cycle during the polysomnography exam. The objective sleep parameters

analyzed were: sleep efficiency, sleep latency, REM sleep latency, total sleep time, awakenings index, percentage of stage 1, 2, N3 sleep and REM sleep. The following questionnaires were applied to assess the subjective sleep: Pittsburgh Sleep Quality Index, Insomnia Severity Index, Chalder Fatigue Scale, Beck Anxiety Inventory, Beck Depression Inventory and Epworth Sleepiness Scale. For the statistical analysis we used the Kruskal-Wallis test and post-hoc Dunn, with $p < 0.05$.

Results: Women in follicular phase exhibited significantly higher sleep efficiency ($89.9 \pm 9.6\%$) when compared to luteal ($83.7 \pm 12.7\%$; $p=0.02$) and menstruation ($83 \pm 10.8\%$; $p=0.008$) groups. During the follicular phase the sleep latency was statistically reduced (7.1min) compared to other time-points of the menstrual cycle ($L=15.9\text{min}$; $M=22.3\text{min}$; $p=0.02$; $p=0.03$, respectively). The other objective sleep parameters and the results of the questionnaires applied did not present statistical differences during the menstrual cycle.

Conclusion: Women in follicular phase showed better sleep than the other time-points of the menstrual cycle. The sleep latency during menstruation was 3 times longer than the follicular phase, indicating that menstruation may be one of the causes of sleep complaints in women.

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0743

MATERNAL EXPERIENCES OF GENDER DISCRIMINATION ARE ASSOCIATED WITH WORSE POSTPARTUM SLEEP

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Introduction: Many new mothers experience poor sleep postpartum, which has been found to increase the risk of negative cardiovascular health and mental health outcomes. A few studies have found that experiences of racial/ethnic discrimination are associated with poor maternal sleep, but less is known about the effect of discrimination in other domains. Previous studies have also not accounted for the effect of infant sleep on maternal sleep, which is known to be a major influence in the first year after birth. This study aims to investigate the association between gender discrimination (GD) and postpartum maternal sleep, controlling for infant sleep.

Methods: The cohort comprised 506 mother-child dyads from the customer base of the Nanit Smart Baby Monitor. At 6–12 months postpartum (Mean $\pm$ SD: 9.2 ± 1.8), maternal experiences of GD (Everyday Discrimination Scale), perceived stress (Perceived Stress Scale (PSS)), and subjective sleep (Pittsburgh Sleep Quality Index) were assessed. Objective measures of infant sleep were obtained using the Nanit Smart Baby-Monitor. Logistic and linear regressions estimated the associations between maternal experiences of GD and maternal sleep, controlling for PSS, household income, infant age and sex, and objective infant sleep duration and wakings.

Results: 34.6% of mothers reported experiencing GD. The average PSS score was 15 (± 6.7). Infants had an average sleep duration of 10h (± 1.2) and an average of 3.1 (± 1.4) nighttime sleep wakings. Maternal experiences of GD were associated with shorter sleep duration (OR=1.67, CI=1.07-2.64) and more sleep disturbances ($\beta = 0.77$, CI= 0.04-1.49). The PSS was associated with more sleep disturbances ($\beta = 0.11$, CI= 0.05-0.16).

Objective infant sleep duration was associated with subjective maternal sleep duration (OR=0.57, CI=0.47-0.69).

Conclusion: Maternal experiences of GD are associated with worse postpartum maternal sleep, suggesting that sleep could serve as a biological pathway relating GD and postpartum health. Future research is needed to investigate the long-term implications of maternal experiences of GD on maternal-fetal health.

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0744

SELF-REPORTED SLEEP QUALITY AND INSOMNIA SYMPTOMS MEDIATE THE ASSOCIATION BETWEEN DEPRESSION AND PHYSICAL ACTIVITY IN OLDER ADULTS

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Introduction: Lack of physical activity (PA) is prevalent and leads to multiple chronic conditions in older adults. Understanding factors contributing to low PA may help develop effective and sustainable PA interventions and promote health in older adults. Depressive symptoms and poor sleep quality have been linked with low PA in older adults. Depression can lead to sleep disturbances. In this study, we tested the association between depression and physical activity in community-dwelling older adults and the possible mediating role of sleep quality in the association.

Methods: We used baseline data collected from an ongoing randomized clinical trial that aims to improve cognitive health in community-dwelling older adults. Participants' depressive symptoms and level of PA were assessed using the Geriatric Depression Scale Short Form (GDS) and Physical Activity Scale for the Elderly (PASE). Sleep quality and insomnia symptoms were measured by the Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI), respectively. Multiple regression models were used to test the associations between the variables. Baron and Kenny's approach and the Sobel test were used to examine the mediation effects of participants' self-reported sleep quality and insomnia symptoms on the association of depression and PA.

Results: The study sample ($n=143$) had a mean age of 70 years (SD=6), most were female ($n=117$, 82%), White ($n=77$, 54%), and had multiple comorbidities ($n=98$, 69%). After adjusting for covariates (age, sex, education, income, race, and Body Mass Index [BMI]), higher GDS score was associated with lower PASE ($\beta=-3.58$, 95% Confidence Interval [CI]: -7.08, -0.79). Mediation analyses showed that both sleep quality (indirect effect: $B=-1.98$, CI: -3.80, -0.15) and insomnia symptoms (indirect effect: $B=-1.97$, CI: -3.94, 0.00) significantly mediated the relationship between depression and PA.

Conclusion: Depressive symptoms were associated with reduced PA among older adults. Self-reported sleep significantly mediated this association. Older adults with more depressive symptoms had worse sleep quality and more insomnia symptoms, which were associated with decreased PA. Our findings suggest we pay more attention to sleep health in older adults, and people with depression may benefit from sleep-focused interventions to promote PA and health.

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0745

SLEEP CHARACTERISTICS AND CARDIOVASCULAR DISEASE RISK AMONG MIDLIFE THAI WOMEN

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Introduction: Sleep disturbances (i.e. poor sleep quality, low sleep efficiency, and Obstructive Sleep Apnea (OSA)) are common during menopausal transition and menopause. These disturbances are associated with increased risk of cardiovascular disease (CVD), obesity, hypertension, and diabetes. However, the association of sleep disturbances and CVD risk among midlife Thai women, living in the US, have not been fully explored. Thus, this study examined the association between sleep characteristics and CVD risk in those women.

Methods: In this cross-sectional study, 120 midlife Thai women completed the Pittsburgh Sleep Quality Index (PSQI), Berlin questionnaire, and Menopause Rating Scale. The main outcome, 10-year risk of CVD, was determined using the BMI-based Framingham Risk Score (FRS). Descriptive, bivariate, robust regression, and Structural Equation Model (SEM) analysis for mediation model were performed using STATA 15.1.

Results: Among participants, their mean age was 51.53 years (SD=7.73), length of stay in the USA was 21.77 years (SD=12.96) and CVD risk score was 6.56 % (SD=5.74). Twenty participants (17%) were at high risk of CVD. The mean subjective sleep quality measured by PSQI was 4.18 (SD=3.03). The majority of participants were good sleepers (n=97, 80.83%). The mean sleep efficiency was 95.36% (SD=5.96). A small portion of the participants had a high risk of OSA as assessed by Berlin questionnaire (n=17, 14.17%). Among sleep characteristics, only the increased risk of OSA was significantly associated with higher CVD risk (B=4.601, p< 0.001).

Conclusion: The findings of this study indicated that an increased risk of OSA is associated with the risk of CVD among midlife women. Sleep duration, sleep quality, or sleep efficiency neither mediated nor moderated CVD risk. Future studies should use objective measures of sleep, such as actigraphy, to better elucidate the effects of sleep parameters on cardiovascular risk.

Support (if any):

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0746

DESIGNING REALISTIC MANAGEMENT OF INSOMNIA IN TEENS (DREAM-IT): PERSPECTIVES ON CBT-I FROM TEENS, PARENTS, AND PROVIDERS

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Introduction: Cognitive Behavioral Therapy for Insomnia (CBT-I) has been established as effective for adults, but less research has been done on its appropriateness for teens. Using a patient-centered approach, we aimed to elicit perspectives on the acceptability and feasibility of CBT-I for teens.

Methods: Teens and parents were recruited via social media, and behavioral sleep medicine providers were recruited via listservs. Focus groups discussed utility, barriers, parent involvement, and potential adaptations for each CBT-I component. We conducted 10 teen focus groups (N = 76, 51% female, 21% male, 28% non-binary; 55% White), 6 parent groups (N = 51, 55% female, 43% male, and 2% non-binary, 47% White), and 2 provider groups (N = 18, 78% female, 17% male, 5% non-binary, 83% White). Providers were predominantly psychologists (78%) and were in practice for M = 9.9 years, SD = 8.09.

Results: Over 60% of teens were “not at all likely” to follow the stimulus control guideline of only using their bed for sleep; a notable barrier included lack of access to other spaces in the home. However, 65% of teens reported willingness to practice sleep restriction, with the adaptation of a two-hour later weekend wake time. Parents were very willing to enforce and/or implement recommendations with their teens, but most teens wanted little or no parent involvement. Providers reported only using sleep logs with teens either “not at all” (14%), “occasionally” (57%), or “half the time” (29%). Similarly, 72% of providers stated that they only discuss cognitive restructuring with teens either “occasionally” or “half the time”. For sleep restriction, most providers (83%) supported taking a more naturalistic, flexible approach. Across stakeholders, limiting screens after bedtime was considered more feasible than before bedtime, and distraction (e.g., listening to audio) was preferred over formal relaxation techniques.

Conclusion: Stakeholder perspectives highlighted the need to adapt CBT-I components for teens, and identified adaptations that were acceptable for teens, and already utilized by providers. Additional focus groups will further assess the acceptability and feasibility of adaptations prior to implementation in an RCT.

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0747

ASSOCIATION OF A NOVEL EEG BIOMARKER OF SLEEP DEPTH WITH CARDIAC AUTONOMIC MODULATION IN ADOLESCENTS

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Introduction: The odds ratio product (ORP), a continuous spectral EEG measure of sleep depth, increases in the transition to adolescence and with psychiatric/behavioral disorders; however, its association with cardiac physiology has been largely unexplored. Heart rate variability (HRV), a continuous spectral EKG measure of cardiac autonomic balance, includes HR oscillations at low frequencies (LF), the standard deviation between normal heart beats or R-R intervals (SDNN) and root mean square of successive differences between normal heartbeats (RMSSD), reflecting sympathetic vs. parasympathetic tone. We aimed to examine the longitudinal association of non-rapid eye movement (NREM) sleep ORP with 24-hour HRV in adolescents.

Methods: We studied 606 children (Md=9y), of whom 418 were followed-up as adolescents (Md=16y) from the Penn State Child Cohort. We extracted ORP in NREM sleep and in the 9s following cortical arousals (ORP-9) from 9-hour, in-lab polysomnography (PSG), and frequency and time-domain HRV indices from 24-h Holter EKG monitoring immediately following PSG. We stratified 24-h HRV data into daytime and nighttime periods. Linear regression analyses examined the associations between change in ORP and ORP-9 with adolescent 24-h HRV indices, adjusting for age, race, sex, BMI, metabolic syndrome score, AHI, insomnia symptoms, actigraphy-TST, and childhood nighttime HRV indices.

Results: While there were no significant associations between ORP and HRV indices in childhood, there were significant longitudinal and cross-sectional associations in adolescence. Longitudinally, a greater increase in ORP since childhood was associated with lower nighttime Log-LF and SDNN in adolescence (both P< 0.05). Similar longitudinal associations were found for ORP-9, with the addition of higher daytime HR and lower daytime SDNN and RMSSD (all P< 0.05). Cross-sectionally, higher ORP and ORP-9 were associated with higher 24-h HR, yet lower Log-LF, SDNN or RMSSD, for both daytime and nighttime periods in adolescence (all P< 0.05).

Conclusion: Greater developmental declines in sleep depth and increases in arousability during NREM sleep are associated with impaired cardiac autonomic balance in adolescence, independent of sleep apnea, insomnia or insufficient sleep. These data also suggest a coupling between fine-grain spectral measures of the sleeping brain and those of sympathetic/parasympathetic cardiac modulation, which may inform cardiovascular risk early in life.

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0748

USING DAILY WEARABLE CARDIO FITNESS AND SLEEP DATA TO PREDICT OBESITY IN EARLY ADOLESCENCE

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Introduction: Obesity, and its co-morbidities, is a serious health risk currently facing adolescents in the US, with increased risk for adult obesity and cardiovascular health problems. Sleep is crucial for energy restorative processes and insufficient sleep influences food intake and appetite regulation. Adolescents are at risk for poor/insufficient sleep, which could, therefore, contribute to obesity risk. Given multifactorial risk factors, there is a need to identify the most salient predictors of adolescent obesity. Predicting adolescent obesity using objective Fitbit data has not previously been investigated and is the aim of the current study.

Methods: We used data collected with the Fitbit Charge 2 device from 2491 participants (Year 2, Mean-age=11.95 years, SD=0.65, 49.5% female) in the Adolescent Brain Cognitive Development (ABCD) Study®. We trained machine learning models (Gradient Boosted Trees and Regularized Logistic Regression) to identify the most important measures that predict obesity (>95 BMI percentile). In addition to sleep (timing, efficiency, duration, and regularity across the week) and cardio fitness (step counts, resting heart rate) Fitbit measures, averaged across seven days, we included socio-demographic characteristics. We ran a grid search embedded in a 2x5 fold cross-validation and we evaluated the performance based on the area under the curve-AUC and accuracy-ACC metrics.

Results: 15% percent of the sample were classified as having obesity. Both classification models performed acceptably high, with the LogReg having better performance (AUC-LogReg=0.76, ACC=85%) than the GBT model (AUC-GBT=0.75, ACC=0.69). Shorter sleep duration, more day-to-day variability in sleep measures, low number of steps with low variability over the week, and higher resting heart rate, with high day-to-day variability, were important predictors. Sociodemographic factors (Hispanic/Latinx ethnicity, African American race, low access to food) were also important predictors.

Conclusion: Results show that there are socio-economic disparities in obesity risk and that shorter sleep duration and more variable sleep patterns, as detected with a wearable, are important predictors of obesity risk. Results highlight the clinical utility of wearable measures and the importance of continuous monitoring of sleep, physical activity, and cardio fitness in adolescents.

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0749

ADOLESCENTS' SELF-REPORTED INSOMNIA, SUBJECTIVE EXPERIENCES AND OBJECTIVE SLEEP MEASURES DURING THE COVID-19 PANDEMIC

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Introduction: Studies examining adolescents' sleep during the COVID-19 pandemic yielded inconsistent results, with some studies finding a significant increase in insomnia symptoms but others finding no change. A majority of these studies used retrospective or concurrent reports of insomnia symptoms and did not include objective sleep measures, making it impossible to know the extent to which the reported symptoms were associated with actual sleep patterns. In addition, these studies did not account for factors that might have biased adolescents' subjective reporting of insomnia such as negative emotions or high levels of pre-bedtime cognitive arousal. The goal of the present study was to examine the associations of self-reported symptoms of insomnia among typically developing adolescents with their emotional experiences, cognitive arousal at bedtime, and objective sleep measures during the COVID-19 pandemic.

Methods: Participants. Seventy-six adolescents (33 female, M(SD) age = 13.74(0.87) years). Procedure. Each participant's sleep pattern was assessed in the home environment using actigraphy and a sleep log for seven consecutive nights in 2021. Adolescents provided information regarding their experiences during the COVID-19 pandemic using the COVID-19 Adolescent Symptom & Psychological Experience (CASPE) questionnaire; information regarding their arousal at bedtime using the Pre-Sleep Arousal Scale and information regarding the insomnia symptoms using the Insomnia Severity Index.

Results: Principal-component analysis produced a three-factor solution for the CASPE labeled as Negative-Anxious, Negative-Angry and Positive Emotions. Hierarchical regression analysis was conducted to examine the cross-sectional associations among adolescents' emotional responses and subjective and objective sleep measures during the COVID-19 pandemic. Being a girl, reporting high level of pre-bedtime cognitive arousal and high Negative-Anxious emotions accounted the explained variance in adolescents' self-reported insomnia symptoms. Actigraphy measured sleep efficiency, latency or duration did not increase significantly the explained variance.

Conclusion: These findings suggest that documentation of adolescents' insomnia during the COVID-19 pandemic might have captured adolescents' negative emotions rather than their objective sleep patterns. Limitations The cross-sectional design of this study limits the ability to determine causality.

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0750

EARLIER BEDTIMES MEDIATE THE EFFECT OF A BRIEF BEHAVIORAL INTERVENTION ON CHILDREN'S BMIz

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Introduction: We demonstrated that a brief behavioral intervention enhanced children's sleep; those with clinically meaningful improvements in sleep (> 30 min/night), had improvements in body mass index (BMI) and BMI z-scores (BMIz). Given emerging evidence regarding the potential importance of not only sleep duration but sleep timing (i.e., bedtimes) for obesity risk reduction, we explored whether sleep duration and/or sleep timing mediated effects of intervention on BMI and BMIz. We hypothesized that the effect of the intervention on 8-week BMI/BMIz would be mediated by earlier bedtimes and longer sleep duration at 2 weeks post-randomization.

Methods: Participants were 71 children 8-11 years old (mean (SD) age = 9.72 (1.00); 69% female; mean (SD) BMIz = 0.91 (0.935)) who slept < 9.5 h/night and were randomized to a 4-session behavioral intervention to increase nocturnal sleep duration (primarily via advancing bedtimes) or to a control (4 sessions; continue with sleep as usual). Sleep was assessed via 7-day actigraphy; height and weight were measured to calculate BMI/BMIz at baseline, 2- and 8-weeks post randomization. We assessed mediation using the medflex R package. Models predicting 8-week BMIz and BMI controlled for baseline BMIz and BMI, respectively. Duration (mean actigraph sleep period) and bedtime (mean actigraph sleep onset) were entered as continuous variables in models.

Results: Relative to control, the behavioral intervention decreased children's 8-week BMIz by -0.027 (SE = 0.013) via its effect on week 2 bedtimes ($z = -2.066$, $p = 0.039$). There was no direct effect of intervention on 8-week BMIz ($z = 1.584$, $p = 0.113$), and although of marginal significance, week 2 sleep duration did not mediate effects of intervention on 8-week BMIz ($z = -1.937$, $p = 0.053$). Findings focused on BMI, although consistent, did not reach statistical significance.

Conclusion: A behavioral intervention designed to enhance school-aged children's nocturnal sleep had a positive impact on children's weight status via its effect on bedtimes, and to a lesser degree, sleep duration. Findings add to emerging work supporting the potential importance of sleep timing in weight regulation.

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0751

EARLY CHILDHOOD SLEEP ASSOCIATED WITH ADOLESCENT SLEEP PHYSIOLOGY AMONG YOUTH WITH ADHD

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Introduction: Sleep complaints are prevalent and impairing symptoms among adolescents with ADHD. Our recent work has shown that key aspects of sleep physiology differentiate adolescents with ADHD from healthy controls (HC), including reduced slow-wave sleep percentage (SWS%) and relative delta power (rDelta) and increased stage 2 percentage (N2%) and relative sigma power (rSigma) after accounting for sleep duration. ADHD-related sleep problems may emerge as early as toddlerhood, yet little is known about the trajectory of sleep disturbances over time in ADHD. The current study examines relationships between early childhood sleep problems and adolescent sleep physiology in ADHD and HC.

Methods: Sixty-two medication-free adolescents (31 with ADHD, mean age=15.3, 50% female) completed a diagnostic interview (Mini International Neuropsychiatric Interview) and 3 nights of at-home polysomnography. Spectral analysis was conducted on a single O1-C3 channel. Caregivers reported on participants' sleep problems during toddlerhood and preschool (Child Behavior Questionnaire; CBQ). Linear regressions controlling for age, sex, and pubertal status examined relationships between early childhood sleep problems and aspects of sleep physiology implicated in adolescent ADHD (SWS%, rDelta, N2%, rSigma) and whether associations differed between groups.

Results: Adolescents with ADHD had greater caregiver-reported early childhood sleep problems compared to HC ($t(60)=3.71$, $p<.001$). In the full sample, greater caregiver-reported sleep problems in early childhood were associated with reduced SWS% ($\beta=-.28$, $p=.04$) and rDelta ($\beta=-.27$, $p=.04$), and increased rSigma ($\beta=.33$, $p=.02$), in adolescence. An early childhood sleep by group interaction was observed for rDelta ($\beta=1.09$, $p=.04$), such that the association was significantly stronger for adolescents with ADHD than HC.

Conclusion: The current study found that sleep problems in early development were associated with disruptions in sleep physiology in adolescents, including relatively less time spent in SWS, reduced delta power, and increased sigma power. Results suggest that ADHD-related sleep problems may begin early in life and persist into adolescence. Screening for and treating sleep problems during early development may be important for supporting sleep health among adolescents with ADHD, and future studies should assess this possibility. Future studies employing longitudinal designs may clarify the contribution of sleep disturbances to the onset and persistence of ADHD symptoms across development.

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0752

LATER CHRONOTYPE, INSUFFICIENT AND DISTURBED SLEEP ARE LINKED TO MENSTRUATION PROBLEMS IN EARLY ADOLESCENT GIRLS

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Introduction: Adolescence in girls is a vulnerable transitional period, characterized by substantial hormonal and physical development, the onset of menarche, dramatic brain development and changes in behavior, including sleep. Menstrual problems, including painful menses, are common among female adolescents, and contribute to school absenteeism. They may also be symptoms of gynecological conditions, which can negatively affect reproductive and general health of women. Limited work has linked sleep disturbances and menstrual problems in adolescents. Here, we examined the association between sleep behavior and menstrual problems in a large sample of adolescent girls in the Adolescent Brain Cognitive Development (ABCD) Study®.

Methods: We fitted linear mixed effect models to examine the associations between sleep behavior and menstrual problems in 1837 post-menarcheal girls (Year 3, Mean-age = 13.03, [12-15] years), assessed as part of the ongoing ABCD Study®. Sleep was assessed with the Munich Chronotype questionnaire (youth-report) and the sleep disturbance scale for children (caregiver-report). Girls answered questions about menstrual cycles and associated problems. We considered age, time since menarche, BMI, use of hormonal contraceptives, and socio-demographic characteristics in the models.

Results: Short sleep duration was related to higher menstrual pain intensity ($p < .01$), irregular menstrual cycles ($p < .01$) and more premenstrual symptoms ($p = .01$). Higher total sleep disturbance score (caregiver-reported) was also associated with higher menstrual pain intensity ($p < .01$) and greater impact of menstrual pain on usual activities ($p < .01$). Participants with a later chronotype ($p = .04$) and later wake-up time ($p = .02$) were more likely to experience an irregular menstrual cycle. Later wake-up time was also related to higher menstrual pain intensity and impact on daily life ($p < .01$). Girls with recent menarche reported heavier menstrual flow ($p = .02$), higher menstrual pain intensity, more premenstrual symptoms, and a greater overall impact of menstrual pain on their usual activities ($p < .01$).

Conclusion: Our results indicate multiple associations between sleep behavior and menstrual problems in adolescent girls. Both menstrual problems and insufficient sleep/sleep disturbances are important for female adolescent health and should be routinely screened for by healthcare providers and school health education providers. Future work is needed with longitudinal analyses to determine directionality of the associations we found between sleep and menstrual problems.

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0753

MOTHERS' SLEEP AND EXECUTIVE FUNCTION: DOWNSTREAM IMPLICATIONS FOR PARENTING AND TODDLERS' EXECUTIVE FUNCTION

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Introduction: Mothers' sleep is positively associated with positive parenting (e.g., responsiveness) — what has not been established is how mothers' executive function (EF) could mediate this association, and how, in turn, mothers' parenting could influence the development of their toddlers' EF.

Methods: Mothers and toddlers ($N = 351$) were followed at child ages 30, 36, and 42 months. Mothers were $M = 32.70$ years old ($SD = 5.03$); 49% of toddlers were male. The sample was largely middle class and 90% White. Fifteen percent of mothers were single. Thirty-one percent of mothers did not work outside the home, and 28% worked full time. Mothers' sleep was measured via actigraphy. Mothers' positive parenting was measured both in the home and the lab. At home, the toddlers' bedtime routine was observed and rated for mothers' responsiveness and involvement. In the lab, mothers' positive affect during free play with their toddler was coded (with independent, inter-rater reliability of $ICC = .80$). The lab measure was correlated with the home visit measure ($r = .22$, $p < 0.01$). Mothers' EF was measured via self-report on the Behavior Rating Inventory of Executive Function-Adult Version (BRIEF), which assesses everyday metacognition, behavior regulation, and emotion regulation. The average, where higher scores reflect worse EF, was used. Toddlers' EF was measured by coders' ratings of toddlers' ability to sustain focused attention during independent free play in the lab visit ($ICC = .83$).

Results: Cross-sectionally, mothers' sleep was associated with their EF ($B = .12$, $p < .05$). In a structural equation model across time, mothers' actigraphic sleep that was shorter, later, and more variable predicted worse EF ($B = 0.07$), which in turn predicted less positive parenting ($B = -0.08$), at levels trending towards significance. Mothers' positive parenting was associated with toddlers' observed sustained, focused attention, both within ($r = .13$, $p < 0.05$) and across time ($r = .13$, $p < 0.05$).

Conclusion: These findings suggest that a mother's sleep can affect her EF and parenting, which can then support toddlers' sustained attention development, an important aspect of executive function.

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0754

SLEEP ECOLOGY IN LOW-INCOME MEXICAN AMERICAN TODDLERS

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Introduction: Healthy sleep is critical for child development, yet disparities exist, with Latino children disproportionately

affected by deficient sleep. Most of what is known about sleep ecology and interventions to improve sleep in young children is based on studies of primarily White, non-Latino, and economically-advantaged families. To ensure the effectiveness of interventions, it is important to understand the contribution of socioecological factors on sleep among toddlers in low-income Mexican American families.

Methods: This study employed in-depth interviews with a purposeful sample of low-income Mexican American Spanish-speaking (n=10) and English-speaking mothers (n=10) of toddlers (18-34 months old). Interviews focused on daily sleep routines, perceptions of toddler sleep behaviors, and environmental contributors. Transcripts were coded by two investigators and analyzed using a content analytic approach.

Results: For sleep-related parenting practices, 70% of mothers reported late child bedtimes ($\geq 9:00$ pm), 75% reported room/bed sharing, and almost a third of children fell asleep at bedtime with a bottle or cup. Maternal beliefs about child sleep included concerns that child crying during the night might disturb neighbors or wake siblings, and child sleep quality improved when the child is not hungry. Contextual factors impacting sleep included schedules, neighbors, and siblings. Specifically, later weekday bedtimes were attributed to maternal (but not paternal) work schedules, while wake times were often a result of a sibling's school schedule. Weekend bedtimes were commonly reported to be delayed for toddlers due to families watching movies. Noisy neighbors, in particular upstairs neighbors, were identified as disrupting children's sleep. Siblings were identified as both facilitating sleep (e.g., helping with routines) and disrupting sleep (e.g., distracting child at nap time).

Conclusion: Findings provide insights on socioecological factors and parental beliefs about sleep ecology in low-income Mexican American toddlers that have implications for the design of interventions to improve child sleep. For example, commonly used behavioral sleep interventions have children sleeping in their own room, or require some crying during the night. However, these approaches may not be a good fit or feasible for this population. To address sleep health disparities, further work is needed to understand socioecological factors that require inclusive adaptations to pediatric sleep interventions.

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0755

THE RELATIONSHIPS BETWEEN SLEEP DURATION, SLEEP EFFICIENCY, AND BLOOD PRESSURE DURING LATE ADOLESCENCE

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Introduction: Elevated blood pressure (BP) is an important modifiable risk factor for cardiovascular disease (CVD), the leading cause of death in the world. Elevated BP in adolescence increases the risk for CVD in adulthood. Unfortunately, 1.3 million adolescents (ages 12 to 19) have extremely elevated blood pressure or hypertension (HTN). Evidence suggests that sleep duration is associated with HTN in adults, but less is known about these relationships during adolescence. Furthermore, there is limited research focused on specific developmental stages, particularly late adolescence, which is the last age group before adulthood.

Also, there is a paucity of research on BP including other sleep variables like sleep efficiency. Therefore, the purpose of this secondary data analysis was to determine if sleep duration and sleep efficiency were associated with BP during late adolescence.

Methods: This secondary data analysis included older adolescents (16-18 years) who participated in the Cleveland Children's Sleep and Health Study, a cohort study examining sleep disturbances and health outcomes. Height, weight, and BP (systolic (SBP) and diastolic (DBP)) were measured using standard clinical procedures. Objective sleep duration and sleep efficiency were measured by at least five days of actigraphy. Subjective sleep duration was averaged from daily self-report. The association was evaluated using Pearson correlations and multiple linear regressions.

Results: This sample included 259 adolescents (age 17.7 ± 0.4 , 63.3% White, 55.6% female). Pearson correlation analysis indicated a negative relationship between sleep efficiency and SBP ($r = -0.210$, $p < 0.001$) with a small-medium effect size (95% CI [-0.316, 0.098]). However, the negative correlation between sleep efficiency and SBP was no longer significant after controlling for assigned sex, race, and body mass index percentiles in a multiple linear regression model.

Conclusion: This secondary data analysis did not provide sufficient evidence on the associations between sleep duration and sleep efficiency with BP in older adolescents, possibly due to the homogenous sample with small variations in BP, sleep duration, and sleep efficiency. Therefore, there is a need for future studies including more heterogenous samples to evaluate the relationships between sleep and BP in this age group.

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0756

AMOUNT AND TIMING OF SEDENTARY BEHAVIOR AND PHYSICAL ACTIVITY FOLLOWING EXPERIMENTAL SLEEP EXTENSION IN ADOLESCENTS

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Introduction: Short sleep and sedentary behavior (SB) are both associated with negative health outcomes including increased risk of metabolic syndrome and obesity. Adolescence is a period characterized by decreased physical activity (PA), increased SB, and chronic short sleep. Literature about the impact of sleep duration on PA in adolescents is limited. The goal of this study was to examine changes in the amount and timing of PA and SB following a one-week sleep extension manipulation.

Methods: The sleep, PA, and SB of 34 short-sleeping (≤ 7 h on school days) and habitually sedentary (< 3 h of physical activity per week) healthy-weight adolescents (age= 16.4 ± 1.1 years; 68% female; 73% non-Hispanic White) were objectively measured in a randomized cross-over study during the academic year. Participants completed one week of Typical Sleep (usual school schedule) and one week of Sleep Extension (≥ 1 h time in bed each school night). Sleep was estimated using wrist-worn actigraphy;

PA and SB were measured using a thigh-worn accelerometer. Paired t-tests compared total minutes and time blocks of PA and SB during each condition.

Results: Total SB decreased from 750.4 ± 109.08 to 699.32 ± 91.76 min/day during Sleep Extension compared to Typical Sleep ($p = 0.018$). Specifically, SB significantly decreased during Sleep Extension in the 6PM-12AM (Typical Sleep = 223.1 ± 66.6 , Sleep Extension = 193.8 ± 46.2 min; $p = 0.04$) and 12AM-6AM (Typical Sleep = 22.2 ± 36.9 , Sleep Extension = 5.8 ± 9.5 min; $p = 0.02$) time frames. There were no significant changes in light, moderate, or vigorous PA between conditions ($p > 0.05$).

Conclusion: Adolescents significantly decreased time spent in SB by nearly 1h per day during Sleep Extension with no change in PA, similar to prior research. Notably, the decrease in SB occurred during the 6PM-6AM time frame, suggesting that the additional sleep displaced time otherwise spent in SB. Reallocation of time spent in SB to PA is associated with positive health outcomes, but no research has examined reallocation to sleep time. Additional studies are needed to identify the related health effects of increased sleep duration and reduced SB in adolescents.

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0757

ASSOCIATIONS BETWEEN OBJECTIVE SLEEP HEALTH AND CARDIOVASCULAR HEALTH IN ADOLESCENTS WITH TYPE 1 DIABETES

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Introduction: Adolescents with type 1 diabetes (T1D) are at risk for early-onset cardiovascular disease due to increased arterial stiffness, decreased endothelial function, and early-stage hypertension compared to healthy peers. Poor sleep health has been associated with greater glycemic variability, increased insulin resistance, and poorer cardiovascular health; however, the relationship between sleep and vascular health has not been studied in adolescents with T1D. The aim of this study was to evaluate associations between objectively measured sleep and cardiovascular health in this population. We hypothesized that better sleep health would correlate with better cardiovascular health.

Methods: Twenty-four adolescents with T1D completed the study during the academic year. Sleep was monitored for one week at home with actigraphy. Watchpat-assessed apnea hypopnea index (AHI) and vascular measures were obtained during an overnight study visit. EndoPAT estimated reactive hyperemia index (RHI) and augmentation index (AI). Dynapulse measured systolic and diastolic blood pressure (SBP, DBP), mean arterial pressure (MAP), heart rate (HR), pulse wave velocity (PWV), and brachial distensibility and resistance (BrachD,

BrachR). Correlations between sleep and vascular measures were examined.

Results: Participants were an average age of 15.5 ± 1.1 years (54.2% female, 83.3% White non-Hispanic, BMI $58.8 \pm 25.8\%$ ile, HbA1c $7.5 \pm 1.2\%$). Average school night (weekday) sleep duration was 6.7 ± 0.8 hours and average sleep efficiency (SE) was $82.8 \pm 6.9\%$. The majority (87.5%) of participants slept less than the clinical recommendation of 8-10 hours per night. Worse actigraphy-estimated SE was associated with higher DBP ($r = -0.52$, $p = 0.02$; mean = 59.2 ± 6.7 mmHg) and MAP ($r = -0.46$, $p = 0.04$; mean = 79.5 ± 7.5 mmHg). Higher AHI was associated with higher BrachR ($r = 0.81$, $p < 0.001$). No significant associations were identified between sleep variables and RHI, AI, HR, PWV, or BrachD (all $p > 0.05$).

Conclusion: Poorer SE and higher AHI were associated with poorer indicators of vascular health in adolescents with T1D, consistent with prior literature linking poorer sleep health with risk factors for hypertension in adults with T1D. Further research is needed to determine if improving sleep can improve cardiovascular comorbidities in adolescents with T1D.

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0758

INITIAL EFFICACY OF A BRIEF, TRAUMA-INFORMED SLEEP INTERVENTION FOR CHILDREN IN FOSTER CARE

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Introduction: Children in foster care experience impairing sleep problems that contribute to greater attachment, emotional and behavioral problems concurrently and over time. Sleep nonetheless remains a critically neglected aspect of health among this vulnerable group. To address the unique sleep needed of this population, we developed a brief, telehealth-delivered behavioral sleep intervention for caregivers of young children currently or formerly in foster care, called Sleep and Adjustment in Foster Environments for Toddlers and Preschoolers (SAFE-T). The current study examined the initial efficacy of SAFE-T.

Methods: N = 25 foster or adoptive foster parents with a 2- to 5-year-old child ($M = 3.9$; $SD = 1.7$) were recruited from the state of Texas. After a baseline assessment including the Children's Sleep Habits Questionnaire (CSHQ) and Parenting Stress Index (PSI), families were randomized to SAFE-T or an active control group. SAFE-T families ($n = 14$) received 3 telehealth-delivered sessions with a therapist who provided information about healthy sleep and trauma-informed suggestions for reducing child sleep problems. Control families ($n = 11$) were sent an informational booklet about sleep to keep. A post-treatment assessment was completed approximately one month after the initial assessment.

Results: Compared to the control group, the SAFE-T group evidenced greater reductions in total CSHQ sleep problem scores ($\eta^2 = .14$), including Sleep Anxiety (partial eta squared = $.16$), Sleep Onset Delay ($\eta^2 = .08$), Bedtime Resistance ($\eta^2 = .09$) and Daytime Sleepiness ($\eta^2 = .07$) scores at post treatment. Based on the PSI, caregivers in the SAFE-T group reported greater reductions in Difficult Child scores ($\eta^2 = .35$), Parent-Child

Dysfunctional Interactions ($\eta^2 = .31$) and Parenting Stress ($\eta^2 = .16$) compared to the control group.

Conclusion: Medium to very large effects were found for reductions in caregiver-reported child sleep problems as well as parenting stress following intervention with SAFE-T. These promising results suggest that a brief, trauma-informed sleep intervention may be effective in improving child sleep health and caregiver well-being in foster families.

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0759

MULTIDIMENSIONAL SLEEP HEALTH IS ASSOCIATED WITH EMOTIONAL WELL-BEING IN ADOLESCENTS

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Introduction: Multidimensional sleep health (MSH) is a population-based approach to capture the 24-hour experience of sleep by incorporating measures of nighttime sleep and daytime functioning that promote physical and mental well-being. We have updated the existing adolescent MSH model to incorporate objective and subjective sleep measures and, in the present study, examined its utility in identifying associations between MSH and behavioral and emotional well-being.

Methods: We studied 377 adolescents (16.4 ± 2.3 yr; 46.4% female; 21.5% racial/ethnic minority) from the Penn State Child Cohort, a randomly-selected population-based sample. Using the RU-SATED framework – regularity, satisfaction, alertness, timing, efficiency, and duration – we derived an MSH composite score based on actigraphy-measured and self-reported sleep data. We examined the associations between MSH and scores on both the adolescent version of the Child Behavior Checklist (CBCL) and on the Pediatric Behavior Scale (PBS). CBCL's internalizing, externalizing, thought and attention problems scores were self-reported, while similar behavioral and emotional cluster scores on the PBS were parent-reported.

Results: Higher MSH scores were associated with lower thought ($r = -0.21$, $p < 0.001$), externalizing ($r = -0.18$, $p < 0.001$), attention ($r = -0.16$, $p < 0.01$) or internalizing ($r = -0.12$, $p < 0.05$) problems. Higher MSH scores were associated with lower scores on the rule-breaking ($r = -0.27$, $p < 0.001$) and aggressive ($r = -0.21$, $p < 0.001$) externalizing subscales. For the internalizing subscales, higher MSH scores were associated with lower anxious-depressed ($r = -0.17$, $p < 0.01$), withdrawn-depressed ($r = -0.14$, $p < 0.01$), and somatic complaints ($r = -0.12$, $p < 0.05$) scores. Analyses based on parent reports on the more fine-grained PBS cluster scores replicated CBCL's associations; for example, higher MSH scores were associated with lower depression ($r = -0.19$, $p < 0.01$) and inattention ($r = -0.12$, $p < 0.05$) as observed by parents.

Conclusion: Optimal sleep health, when considered as a multidimensional construct, is associated with emotional well-being and better behavioral outcomes in adolescents. Our MSH model, derived from objective and subjective sleep metrics, is able to capture similar trends from self-report and parent-report measures of emotion and behavior.

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0760

APPLYING MACHINE LEARNING TO EXAMINE SETTLING DOWN PERIOD FOR CHILDREN WITH AND WITHOUT SENSORY HYPERSENSITIVITIES

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Introduction: Children with sensory hypersensitivities have poorer subjective sleep health than their peers. However, traditional actigraphy variables (e.g., sleep efficiency, sleep duration) do not adequately capture these sleep deficits. In qualitative interviews, caregivers of children with sensory hypersensitivities identified the settling down period prior to sleep as a major family stressor, potentially indicating a novel target for intervention. We applied machine learning techniques to thoroughly characterize and discriminate differences in the settling down period for children with and without sensory hypersensitivities.

Methods: Children (ages 6-10) with sensory hypersensitivities ($n=20$) and children without sensory hypersensitivities ($n=29$) wore the GT9X Actigraph continuously for 2 weeks and caregivers completed daily sleep diaries. Settling down period (caregiver reported start of settling down until actigraphy indicated sleep onset) was isolated for each night and 7 features were extracted from the activity data (mean magnitude, maximum magnitude, kurtosis, skewness, Shannon entropy, standard deviation, interquartile range). Ten-fold cross-validation with random forests were used to determine the accuracy, sensitivity, and specificity of differentiating groups.

Results: We achieved an 83% accuracy in classifying children with sensory hypersensitivities versus those without hypersensitivities (sensitivity = 84%; specificity = 82%). Feature importance maps showed that the most important feature for differentiating groups was maximum activity count magnitude during the settling down period; children with sensory hypersensitivity had higher maximum bouts of activity during settling down. The hypersensitive group also showed a higher variance in activity during settling down, as demonstrated by greater interquartile range (variance within the time window), standard deviation of activity, and Shannon entropy (the amount of uncertainty in the time window).

Conclusion: Our novel machine learning analysis successfully uncovered objective features within the settling down period that differentiate children with sensory hypersensitivity from their peers. Our data highlights exciting new potential targets for intervention: children with sensory hypersensitivities have larger and sporadic bouts of activity during their settling down period that clearly set them apart from their peers without hypersensitivities.

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0761

DIFFERENCES IN SLEEP BARRIERS BETWEEN SUMMER AND SCHOOL IN ADOLESCENTS WITH TYPE 1 DIABETES

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Introduction: Sleep is recognized as an important component of health for people with type 1 diabetes (T1D), with significant associations identified between sleep quality, glycemic outcomes, and diabetes self-management. Adolescents, who are particularly vulnerable to insufficient sleep and have difficulty meeting glycemic targets, typically experience differences in sleep during the summer versus school months. We examined barriers to sufficient sleep during summer and fall months amongst adolescents ages 11-17 with T1D.

Methods: Adolescents (n=10, mean age 14.1 years, 40% female, 80% non-Hispanic White) with T1D participated in qualitative, semi-structured interviews to explore seasonal differences in barriers to sleep. Interviews were audio and video recorded, transcribed using Otter-AI software with manual review for accuracy, independently coded by two trained research staff, and themes were identified.

Results: Interviews were completed by five adolescents during the summer and five during school months. Barriers to achieving sufficient sleep for both time periods included diabetes-related issues (e.g. hypoglycemic episodes, glucose variability, fear of hypoglycemia, and device use), peers, activities, and family factors. School, activities, family and diabetes disruptions were equally prominent barriers during the school year, whereas diabetes disruptions were the most common barriers during the summer. While device alarms disrupted sleep at both times, adolescents reported that diabetes technologies had an overall net positive impact on sleep during the school year due to reduced worry, but a neutral impact during the summer. Adolescents agreed it would be helpful to talk about sleep concerns or ways to improve sleep.

Conclusion: Diabetes management is a consistent reason for insufficient sleep duration in adolescents with T1D. In addition, similar to adolescents without T1D, academic, social, and family obligations were barriers to obtaining sufficient sleep during the school year. While some sleep disruptors may not be modifiable, assessment by a clinician who can provide guidance on methods to improve sleep health may be beneficial and well received. Because diabetes health care providers have frequent contact, routine visits provide an opportunity to identify sleep concerns and provide both diabetes and non-diabetes guidance to address sleep health. Further exploration of sleep behaviors and barriers in adolescents with T1D is warranted.

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0762

EARLY LIFE SLEEP CHARACTERISTICS AND THEIR ASSOCIATIONS WITH 1 TO 5.5 YEARS OLD RESPIRATORY AND ALLERGIC MULTI-TRAJECTORIES

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Introduction: Sleep troubles have been associated with respiratory and allergic health problems in children, however the time line of their association is overlooked. The current study examined the associations between: (1) sleep patterns at age 1 year and respiratory and allergic multi-trajectories between 1 and 5.5 years; (2) respiratory and allergic multi-trajectories between 1 and 5.5 years and sleep patterns at age 5.5 years in a French birth cohort.

Methods: Clusters of sleep characteristics at age 1 year (nocturnal sleep duration (NSD), day sleep duration (DSD), sleep onset difficulties (SOD), night awakenings (NA)) and at age 5.5 years (NSD, SOD, NA) and respiratory and allergic symptoms multi-trajectory groups between 1 and 5.5 years (wheezing, asthma medication, eczema, allergic conjunctivitis) were identified using unsupervised methods. Associations between sleep clusters at each age and multi-trajectory groups were assessed using multinomial regressions adjusted for potential confounding factors among 9,577 children.

Results: Two sleep clusters were identified at both age 1 and 5.5 years: C1a (79.9%, age 1 year) and C1b (83.1%, age 5.5 years) characterized by adequate sleep duration and good sleep quality; C2a (20.1%, age 1 year) and C2b (16.9%, age 5.5 years) characterized by shorter sleep duration and poorer sleep quality. Four multi-trajectory groups were also identified: G1 (no/few symptoms, 44.4%), G2 (persistent non-respiratory allergic symptoms, 23.1%), G3 (transient early respiratory symptoms, 25.2%), G4 (persistent respiratory and allergic symptoms, 7.3%). Belonging to cluster C2a was associated with an increased odds of belonging to G3 (adjusted odds ratio [95% interval confidence]; 1.14 [0.99-1.31]) and G4 (1.29 [1.05-1.59]). After accounting for sleep clusters at age 1 year, belonging to G4 was associated with an increased odds of belonging to cluster C2b (1.21 [0.98-1.5]).

Conclusion: Sleep disturbances at 1 year were associated with poorer respiratory and allergic health between 1 and 5.5 years and respiratory and allergic problems between age 1 and 5.5 years were associated with sleep troubles at 5.5 years suggesting bidirectionality. Further research is needed to explore potential coevolution of sleep and allergic and respiratory troubles during early childhood.

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0763

EFFECT OF RACIAL AND SOCIOECONOMIC DISPARITIES ON SLEEP DURATION IN CHILDREN

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Introduction: National Survey of Children's Health is a population-based, nationally representative online and paper survey of primary caregivers of noninstitutionalized U.S. persons aged ≤17 years. Data from 2016-2018 survey (MMWR 2021) published by the Center for Disease Control (CDC) highlighted the racial and economic disparities in sleep duration among children. Children from Black and Hispanic ethnicities had significantly lower sleep duration compared to their white counterparts. Short sleep duration was also more prevalent among families with lower income or lower parental educational attainment. We analyzed the data from questionnaires administered to parents of children presenting for polysomnogram.

Methods: We analyzed a consecutive sample of caregiver completed questionnaires (n=252) of patients between 4- 18 years referred for polysomnogram to our Pediatric Sleep Program. Questions ranged from demographic information to sleep wake times, sleep duration, sleep environment and parental knowledge of age-appropriate sleep requirement. Regression analysis was performed to study the effect of parental education and ethnicity on sleep duration and parental knowledge of sleep requirement.

Results: Children born to mothers with college education or higher had significantly longer duration of sleep ($p < 0.05$). Mothers with college education or higher were also more aware of age-appropriate sleep requirements. ($p < 0.05$). Children of Asian, White, and Mixed ethnicity were more likely to have age-appropriate sleep duration compared to Black and Hispanic ($p < 0.05$). Parents of Asian and White ethnicity were more aware of age-appropriate sleep requirement ($p < 0.05$). Parental marital status or father's education status did not show similar effects on sleep duration or knowledge about sleep requirement.

Conclusion: Maternal education and family ethnicity had a significant effect on sleep duration as well as awareness of age-appropriate sleep requirement. Children from families with lower parental educational attainment and Black and Hispanic ethnicities have shorter sleep duration. Findings from our small community-based study mirrored data from large population-based data collected by CDC. Sleep disparity associated with various social determinants of health can increase family stress resulting in environmental and psychological factors that negatively affect sleep duration. Targeted education regarding age-appropriate sleep duration should be provided for ethnic minorities and families with lower income and lower parental education attainment.

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0764

END OF DAYLIGHT SAVING AND SLEEP CHILDREN 4-24 MONTHS

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Introduction: Daylight saving time (DST) imposes a twice yearly 1h change in local clock time. Although it may seem a small adjustment, there is increasing awareness of the potential acute and long term effects at the individual and population level. Several studies have shown detrimental effects on sleep patterns, but mostly focusing on adults. Only one study has looked at the effect in infants' sleep of change from standard time (ST) to DST, reporting negative effects. One study limitation was the reliance on parental reports of infant sleep. In addition, effects of the change from DST to ST are unknown. We hypothesize that the change from DST to ST would lead to earlier rise times, leading to sleep loss in the week following the change.

Methods: Caregivers of 510 children ages 3-24 mos (M=9.8 mos) tracked their child's sleep using Nanit baby-monitor. Sleep metrics analyzed were: Nighttime sleep duration (NSD) and midpoint, number of night-wakings and sleep efficiency. Wilcoxon rank sum tests compared the average of each sleep metric for the week preceding the time change (Oct 31st-Nov 4th 2022, Baseline) with sleep metrics for each night of the following week (Nov 7-11 2022, post-DST week). Analyses were repeated stratifying by age group (4-6, 7-12 and 13-24 months).

Results: After the time change, there was no change in NSD or sleep efficiency. There was a significant decrease in the number of night-wakings for infants 3-6 months, with an average of 0.5 fewer wakings per night compared to Baseline (Baseline mean=5 wakings). Midpoint was significantly earlier for all ages by an average of 10min, every day of the post-DST week.

Conclusion: The return to ST affected infants' sleep midpoint. Observed effects were minor compared to those reported in previous literature for the ST to DST change, in line with other fields like cardiovascular health. This easier adjustment could be attributed to the fact that during DST there is an increased mismatch between body clock and social clock time, thus infants more readily adjust to a return to ST which minimizes this mismatch.

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0765

ENLARGED PERIVASCULAR SPACES IN INFANCY: ASSOCIATIONS WITH AUTISM DIAGNOSIS, CEREBROSPINAL FLUID VOLUME, AND LATER SLEEP PROBLEMS

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Introduction: Since the re-discovery of the glymphatic system, there has been an increased interest in perivascular spaces (PVS) and cerebrospinal fluid (CSF) characteristics in relation to sleep. Enlarged PVS (ePVS) are associated with neurological disorders and sleep problems, and excessive extra-axial CSF (EA-CSF) volume is associated with autism spectrum disorder (ASD). However, ePVS has not been studied in infancy in relation to

autism, EA-CSF volume, or sleep problems. The objectives of this study, therefore, are to examine whether ePVS is 1) more prevalent in infants who later develop ASD, 2) related to EA-CSF volume, and 3) associated with later sleep problems.

Methods: The study was conducted on a prospective, longitudinal cohort from the Infant Brain Imaging Study (IBIS). Participants underwent neuroimaging at 6-, 12-, and 24-months of age, and parent-reported Children's Sleep Habits Questionnaires (CSHQ) were collected at a follow-up visit at school age (age range = 7-12 years, $M = 10.0$). A total of 311 participants were included: 47 infants at high familial likelihood for ASD who were later diagnosed with ASD (HL+), 180 high likelihood infants not diagnosed with ASD (HL-), and 84 low likelihood control infants (LL-). The CSHQ was available on a subset of 109 participants.

Results: Significant group differences in ePVS rates were found at 24 months of age ($p=0.041$), with 44.7% of the HL+ group having ePVS, compared to 26.7% in the HL- group ($p=0.017$) and 26.2% in the LL- group ($p=0.031$). ePVS at 24 months was associated with greater EA-CSF volume from 6-24 months ($p=0.002$) and greater sleep disturbances at school-age ($p=0.006$), regardless of ASD diagnosis.

Conclusion: The presence of ePVS during infancy was associated with ASD diagnosis, elevated EA-CSF volume, and more frequent sleep disturbances. Results suggest that infants with ePVS should be monitored for early signs of ASD and potential long-term sleep problems, particularly sleep disturbances. Further examination is needed to establish whether early ePVS is ASD-specific or an indication of early glymphatic system dysfunction that can put infants and children at risk for atypical brain development and later sleep problems.

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0766

QUALITATIVE DEVELOPMENT OF THE PEDIATRIC NARCOLEPSY PATIENT-REPORTED OUTCOMES (PNPROS) QUESTIONNAIRE

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Introduction: There is a significant need to reflect patient needs and values in healthcare outcome measures. In pediatric narcolepsy, there are no patient-reported outcome measures to assess disease burden, determine treatment efficacy, and guide future drug development. The aim of this study was to develop items for pediatric narcolepsy patient-reported outcomes (PNPROS) measure.

Methods: A standardized approach for the development of patient-reported outcome measures was used to develop the PNPROS items, including domain and facet definitions; a systematic, comprehensive literature review; in-depth interviews with pediatric narcolepsy experts ($n=3$); and qualitative interviews with children and adolescents with narcolepsy ages 9-17 years ($n=15$) and parents of children/adolescents with narcolepsy ($n=15$). Once the preliminary item bank was created, iterative refinement was completed through another round of qualitative interviews with children/adolescents ($n=11$) and parents ($n=11$), as well as experts in pediatric sleep, narcolepsy, and measure development.

Results: The literature review and expert interviews contributed to the final conceptual framework, which included two domains. The first, Narcolepsy Symptoms, included 13 facets (behavior, brain fog, cataplexy, cognitive difficulties, difficulty waking, disrupted nighttime sleep, daytime sleepiness, hallucinations, mood, nightmares, parasomnias, sleep paralysis, and tired/fatigue). The second, Functioning Impairment, included 11 facets (bothered, brain fog, emotional/mood, home/family, lack of understanding, life satisfaction, safety, school/academic, social, weight gain, work/extracurriculars). The literature review identified 714 items from 27 measures; after redundancies or irrelevant items were removed, the 337 remaining items were assigned a domain and facet through team consensus. Qualitative interviews resulted in a further reduction of items due to lack of clarity or redundancy, resulting in the final 55 items to be included in field testing.

Conclusion: This rigorous qualitative approach to the development and evaluation of content validity for the PNPROS item pool resulted in 25 items that assess Narcolepsy Symptoms and 35 items that capture Functional Impairment. Once the psychometric properties are established, through field testing in a diverse, national sample of pediatric patients ages 9-17 years with narcolepsy, the measure will be useful for evaluating disease burden and treatment efficacy in both clinical and research settings.

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0767

INSIGHT RESPONSIVE INFANT PARENTING INTERVENTION AND CHILD SLEEP AT AGE 6 YEARS

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Introduction: The Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) responsive parenting (RP) intervention for first-time mothers resulted in more responsive bedtime parenting and longer infant sleep duration in the first year after birth. The current analysis evaluates intervention effects on parent-reported sleep behaviors and objectively-measured sleep at child age 6 years.

Methods: Mothers ($n=279$) were randomized to the RP or control intervention, delivered by nurses at home and clinic visits through child age 2.5 years. Sleep content focused on establishing bedtime routines, age-appropriate bedtimes, and promoting self-soothing at bedtime and after night wakings. At 6 years, children completed wrist actigraphy (Spectrum Plus) for 7 days during the school year. Children with ≥ 3 valid days were included in analyses ($n=162$). Mothers ($n=173$) completed the Children's Sleep Wake Scale and Children's Sleep Hygiene Scale. Study group differences for 10 sleep actigraphy variables (M/SD of onset, offset, and midpoint of sleep timing, sleep maintenance efficiency, and total sleep time), as well as survey scores, were examined.

Results: Children (mean age 6.7 years, 96% non-Hispanic White) slept on average 8.8 hours $\pm$ 33 minutes per night, with 40% meeting the minimum recommendation of 9 hours. The mean sleep onset time was 9:14 pm $\pm$ 50 minutes. There were no significant study group differences in any actigraphy variables.

RP mothers reported higher scores for Total Sleep Quality (4.6 ± 0.5 vs. 4.4 ± 0.6 , $p=0.03$), 'Going to Bed' subscale (4.3 ± 0.8 vs. 4.0 ± 0.9 , $p=0.03$), which captures child compliance with bedtime, and 'Reinitiating Sleep' subscale (4.6 ± 0.9 vs. 4.2 ± 1.1 , $p=0.005$), which captures the child's ability to go back to sleep on their own after waking. Total Sleep Hygiene score did not differ between groups.

Conclusion: The INSIGHT intervention targeting sleep in infancy was associated with improved parental perception of bedtime stalling and self-soothing behaviors at age 6 years. However, this did not translate into differences in sleep duration, timing, or quality measured by actigraphy. Future research should examine strategies to maintain the impacts of the RP intervention on infant sleep into middle childhood.

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0768

MELATONIN USE FOR SLEEP DISTURBANCE IN SCHOOL-AGED CHILDREN AND ADOLESCENTS: AN AUSTRALIAN PHARMACY PERSPECTIVE.

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Introduction: Melatonin is a widely used pediatric sleep aid. While readily available internationally, regulatory changes in Australia have only recently allowed over-the-counter access for patients aged over 55, triggering renewed public interest in melatonin. However, melatonin access for younger patients with sleep disturbances remains a prescription-only medicine. Furthermore, pharmacist opinions about the use of melatonin in pediatric patients remain unexplored. This study aimed to investigate Australian community pharmacists' perspectives toward melatonin use in school-aged children and adolescents.

Methods: A qualitative study was conducted in a convenience sample of community pharmacists/interns practicing in metropolitan Sydney. Participants completed an online questionnaire capturing demographic information and practice context. Participants subsequently indicated their interest in participating in an in-depth semi-structured interview. Interviews were guided by a schedule of questions exploring pharmacists' knowledge, beliefs, and attitudes toward melatonin use in pediatric patients. The interviews were digitally recorded, transcribed verbatim, and analyzed using the Framework Approach to identify emergent themes. Recruitment continued until thematic saturation was reached.

Results: Twenty-four interviews were conducted with pharmacists ($n=19$) and interns ($n=5$). Participants were mostly female (67%) with a mean age of 29.8 (range: 22-56) years. Pharmacists managed 25.3 (1-300) sleep-related inquiries per day on average and received direct product requests for melatonin 15.9 (2-100) times per week. Preliminary analyses identified three key themes: Conflicting Opinions on Safety, Product Cost and Formulation Availability, and Gaps in Clinical Education. Pharmacists' involvement in pediatric melatonin use has largely been within the domains of dispensing or compounding prescriptions. While melatonin was perceived as a "better choice over other sedatives" for children, pharmacists expressed uncertainty about the evidence base concerning long-term use in younger age groups, relying heavily on physicians for prescribing discretion and patient

supervision. The need for affordable proprietary products with flexible dosing options and targeted education around melatonin and circadian sleep health was also expressed by participants.

Conclusion: Findings allude to the need for greater availability and accessibility of pediatric-specific melatonin formulations, as well as refinement of clinical education resources that specifically address the use of melatonin among school-aged children and adolescents.

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0769

MULTIDIMENSIONAL SLEEP HEALTH IN ADOLESCENTS FROM THE GENERAL POPULATION: DEFINITION, THRESHOLDS AND CONSTRUCT VALIDITY

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Introduction: The RU-SATED model – regularity, satisfaction, alertness, timing, efficiency, and duration – captures the 24-hour experience of sleep to assess multidimensional sleep health (MSH). However, most prior evidence comes from middle-aged adults. We provide updated MSH data in adolescents by leveraging objective and self-reported sleep measures.

Methods: We studied 377 adolescents (16.4 ± 2.3 yr; 46.4% female; 21.5% racial/ethnic minority) from the Penn State Child Cohort, a randomly-selected population-based sample. Each MSH domain was categorized as "good" or "poor" using cut-offs informed by prior studies and expert consensus. Good cut-offs, assigned a score of 1, that were derived from actigraphy-measured data included: the standard deviation of sleep midpoint ≤ 1 -h (RU), mean of sleep midpoint 2:00-4:00 (T), mean value of sleep efficiency $\geq 85\%$ (E), and mean total sleep time ≥ 7.5 -h (D). Good cut-offs derived from self-reported rating scales included the absence of insomnia symptoms (S) or excessive daytime sleepiness (A). Values considered poor based on these cut-offs were assigned a score of 0. Scores were summed across all domains to obtain a composite score ranging from 0 to 6, with higher scores indicating better MSH. Morningness and Tanner staging were self-reported, while Sleep and Arousal clusters scores on the Pediatric Behavior Scale were parent-reported.

Results: The mean composite score was 3.03 ± 1.30 and domains A and D were most commonly rated as poor (64.5% and 65.3%, respectively). Younger age ($r=-0.13$, $p<0.05$) and identifying as non-Hispanic white ($r=-0.14$, $p<0.01$) were significantly associated with higher MSH scores, while sex ($r=-0.04$, $p=0.40$), Tanner staging ($r=-0.06$, $p=0.29$) or BMI percentile ($r=-0.07$, $p=0.15$) were not. Greater morningness ($r=-0.29$, $p<0.01$), less disturbed sleep ($r=-0.28$, $p<0.01$) and higher arousal ($r=-0.21$, $p<0.01$) scores were associated with higher MSH scores.

Conclusion: Our data-driven approach can be used to assess MSH in the adolescent population. Our definition captures previously identified health disparities in MSH in adults and shows optimal construct validity against self-reports of circadian preference and parent observations of adolescents' degree of sleep

disturbance and arousal. Improving sleep duration and daytime alertness appear to continue to be the most relevant domains impacting overall MSH in adolescents.

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0770

THE EFFECT OF IN-HOME SLEEP EXTENSION ON INSULIN SENSITIVITY FOR HABITUALLY SHORT-SLEEPING ADOLESCENTS

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Introduction: The interplay of physiological and behavioral factors of adolescence that result in dramatically insufficient sleep may confer a notable cardiometabolic risk. Increasing sleep duration reverses the negative metabolic consequences of insufficient sleep in adults, but this has not been examined in youth. Thus, the current study aimed to evaluate the impact of in-home sleep extension on insulin sensitivity (Si) in habitually short-sleeping adolescents.

Methods: Twenty-six healthy adolescents obtaining ≤ 7 h sleep on school nights (age=16.6 $\pm$ 1.1, 69% female, 73% non-Hispanic White) completed a randomized crossover trial consisting of one week each of Typical Sleep (usual school schedule) and Sleep Extension (≥ 1 h additional time in bed) during the academic year. Sleep was estimated via actigraphy, and an intravenous glucose tolerance test (IVGTT) measured Si following each condition. Spearman and Kendall correlations assessed associations and paired samples t-tests and Wilcoxon signed-rank tests examined change in variables from Typical Sleep to Sleep Extension.

Results: A significant association between sleep and insulin sensitivity was observed during Typical Sleep, with poorer Si associated with longer sleep onset latency ($\rho=-0.29$, $p=0.04$), and greater variability in waketime ($\rho=-0.44$, $p=0.02$) and sleep duration ($\rho=-0.43$, $p=0.03$). During Sleep Extension, participants significantly increased sleep duration by 1.4 $\pm$ 0.7h (Typical Sleep=5.59 $\pm$ 0.82, Sleep Extension=6.95 $\pm$ 0.83 h; $p<0.001$) by shifting bedtimes to an earlier clock hour (Typical Sleep=00:34 $\pm$ 01:12; Sleep Extension=23:10 $\pm$ 00:57; $p<0.001$). Si did not significantly change between conditions ($p=0.52$). However, a trend was observed for a decrease in fasting glucose during Sleep Extension compared to Typical Sleep (Typical Sleep=92.5 $\pm$ 8.87; Sleep Extension=88.48 $\pm$ 12.06 mg/dL; $p=0.055$).

Conclusion: Habitually short-sleeping adolescents were successful at increasing sleep duration during an in-home intervention, but Si did not change compared to Typical Sleep. Notably, sleep duration during Sleep Extension was still less than the 8-10 h of sleep per night recommended for adolescents. A sufficiently early bedtime that supports adequate sleep is a biological challenge for adolescents when wake times are fixed due to early school start times. Future research is recommended examining whether combining sleep extension with a circadian health intervention can have a larger impact on sleep and cardiometabolic outcomes in adolescents.

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0771

AN INNOVATIVE INTERVENTION ON PARENTAL SLEEP BELIEFS AND PRACTICES: ITS EFFECTS ON CHILDREN'S SHORT-TERM SLEEP

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Introduction: Inadequate parental sleep beliefs and practices have been associated with the development and maintenance of sleep difficulties in children. Disrupted sleep at a young age leads to adverse child outcomes and affects parents' sleep and family functioning. Our goal was to evaluate the effects of improved parental sleep beliefs and practices on child and parent sleep in the short term. Hence, we designed an innovative intervention for developing parenting skills in children's sleep management.

Methods: 15 caregiver-child dyads with preschool-age children were recruited through daycare centers and placed in small groups for a two-hour intervention and a follow-up. Children's and parents' sleep were respectively measured using the Children's Sleep Habits Questionnaire (CSHQ) and the Pittsburgh Sleep Quality Index (PSQI). Parental beliefs were assessed by three subscales (Setting Limits, Anger, Doubt) of the Maternal Cognitions about Infant Sleep Questionnaire (MCISQ). Parental practices were measured by two factors (Sleep Conflict, Sleep Dependence) of the Parent-Child Sleep Interactions Scale (PSIS). Data were collected before the intervention and two weeks later. Paired-sample t-tests were used to measure changes in each variable.

Results: Significant improvements were observed in scores on CSHQ subscales measuring Bedtime Resistance ($t(14)=3.15$, $p=.004$; $M=11.3$ vs $M=9.47$), Sleep Onset Delay ($t(14)=3.21$, $p=.003$; $M=2.40$ vs $M=1.67$), Parasomnias ($t(14)=2.35$, $p=.017$; $M=10.9$ vs $M=9.87$), and Daytime Sleepiness ($t(14)=2.90$, $p=.006$; $M=13.0$ vs $M=11.3$). Accordingly, total CSHQ scores were significantly lower ($t(14)=4.70$, $p<.001$; $M=55.7$ vs $M=49.5$) reflecting less sleep disturbance in children. Parents' sleep was of superior quality, with global PSQI scores marginally decreased ($t(14)=1.75$, $p=.051$; $M=6.93$ vs $M=6.20$). Lower Sleep Conflict scores ($t(14)=3.44$, $p=.002$; $M=7.67$ vs $M=4.8$) and total PSIS scores ($t(14)=3.59$, $p=.001$; $M=13.3$ vs $M=9.00$) indicated better parental sleep practices.

Conclusion: These preliminary results show that parental interventions on children's sleep management can improve child sleep and parental sleep practices. These results also highlight that parental practices about their child's sleep can change independently of their beliefs. Long-term measures will help verify the course of changes in parents' sleep and beliefs regarding their child's sleep.

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0772

ASSOCIATIONS OF SLEEP DURATION AND MATERNAL POSTNATAL DEPRESSION IN INFANTS WITH AUTISTIC SIBLINGS

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Introduction: Evidence suggests sleep differences emerge in the first three years of life for autistic individuals (MacDuffie et al., 2020) and may be a possible endophenotype in unaffected siblings (Naeem et al., 2021). In neurotypical samples, postnatal depression has also emerged as a potential contributor to infant sleep challenges (Dias & Figueiredo, 2021). Questions remain on the associations between infant sleep duration, maternal postnatal depression, and family history of ASD as well as how these variables interact to predict future autistic traits.

Methods: Participants (N=74) were enrolled in a prospective longitudinal study on early autistic traits and included infants with an autistic sibling (n=33, EL) and with no familial history of ASD (n=41, LL). At 6 months, caregivers completed the Edinburgh Postnatal Depression Scale (EPDS) and a 24-hour retrospective sleep log. At 12 months, clinicians administered a standardized observation of autistic traits (SORF) the includes scores related to deficits in social communication (SCD) and restrictive and repetitive behaviors (RRBs).

Results: At 6 months, EL infants spent significantly more time asleep during the day than LL infants, ($t(45)=2.89$, $p<.01$). There were not significant differences in nighttime sleep duration or EPDS scores between groups. In examining the influence of self-ratings of maternal depression and likelihood status on sleep duration, the model was significant for daytime sleep ($F(2, 36)=4.27$, $p=.02$), but not nighttime sleep. Likelihood status, not EPDS score, predicted more hours spent asleep in the daytime. When assessing the role of status and sleep-related variables on future autistic traits, only decreased nighttime sleep duration at 6 months was related to greater RRBs at 12 months ($F(3, 10)=15.26$, $p=.02$), regardless of likelihood status.

Conclusion: The results of this study suggest that EL infants may sleep more in the daytime at 6 months. Reduced nighttime sleep at 6 months possibly signal future autistic traits, regardless of likelihood status. Future research should examine actigraphy data and its relationship to the etiology of ASD in larger samples.

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0773

BEHAVIORAL SLEEP CHARACTERISTICS MAY DIFFER IN TODDLERS WITH EPILEPSY COMPARED TO CHILDREN WITHOUT EPILEPSY

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Introduction: Sleep is cited as a prominent concern by many caregivers of children with epilepsy. Few studies have examined this issue systematically.

Methods: Caregivers of 11 toddlers (12-36 months old) were recruited from two academic Pediatric Neurology clinics and responses were compared to children without epilepsy (n=343). Caregivers responded to a novel questionnaire being developed for infants and toddlers. Two domains were analyzed (Caregiver/Child Behavior and Comfort Object/Bedtime Routine). The domain score equaled the sum of the scores for each item divided by the number of items answered. Items in the Caregiver/Child

Behavior domain were: 1. "My child's total sleep time and sleep routine are problematic for me"; 2. "I am frustrated by my child's sleep problem"; 3. "I worry about my child's health due to their sleep problem"; 4. "My child wakes up shortly after they have fallen asleep"; 5. "My child wakes up distressed in the middle of the night"; 6. "My child's sleep is restless"; 7. "My child does not seem well rested during the day"; 8. "My child requires a parent/caregiver's presence to fall asleep (e.g. in the room, in the bed)"; 9. "My child moves their legs in a cycling pattern, or kicks and moves their legs excessively in the middle of the night". Items in the Comfort Object/Bedtime Routine domain were: 1. My child requires a parent/caregiver's presence to fall asleep (e.g., in the room, in the bed)"; and 2. "My child requires the presence additional comfort measures (e.g., aromatherapy, noise machine, weighted blanket, music) to fall asleep".

Results: The Caregiver/Child Behavior score was higher (worse) in toddlers with epilepsy (3.40; SD 0.72) compared with controls (1.94; SD 0.93) $p<0.0001$. Yet, toddlers with epilepsy had lower (better) scores in the Comfort Object/Bedtime Routine domain (2.23; SD 1.25) compared with controls (3.20; SD 1.25) $p=0.01$.

Conclusion: Sleep behavior is complex in toddlers with epilepsy and can lead to parental frustration and worry in comparison to toddlers without epilepsy. Further investigation into this relationship could provide opportunities for effective interventions to improve sleep and quality of life for children with epilepsy.

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0774

CHARACTERIZATION OF SLEEP SPINDLES AND SLEEP ARCHITECTURE IN ADOLESCENTS WITH FUNCTIONAL ABDOMINAL PAIN

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Introduction: Functional abdominal pain disorder (FAPD) is a common disorder in adolescents with an estimated prevalence of 13.5 % worldwide. It is characterized by nearly-continuous or recurrent pain localized in the abdomen but poorly related to gut function. A greater incidence of sleep disorders has been described in pediatric populations with FAPD, but no studies have characterized differences in sleep continuity and quality that may be experienced by this population. This study examines differences in sleep spindles experienced by adolescents with FAPD due to the role of sleep spindles in sleep stabilization as it relates to pain.

Methods: Subjects ages 11-18 years with FAPD and age/gender matched controls were recruited and underwent prospective polysomnography (PSG). PSGs were conducted according to AASM accredited standards, scored by a registered PSG technician, and interpreted by a boarded sleep physician. Using only artifact free epochs, sleep spindles were identified and characterized using the YASA python package / A7 algorithm with selections confirmed against gold standard (manual scoring). Comparisons of FAPD and control groups were performed using t-test or Wilcoxon rank sum tests for normal and non-normally distributed data,

respectively. The PSG scorers and those performing spindle analysis were blinded to control vs study group throughout the study.

Results: The study included 21 adolescents with FAPD and 20 controls. When compared to controls, the FAPD group had an elevated arousal index (FAPD: 10.08/hr $\pm$ 4.89/hr, control: 7.32/hr $\pm$ 3.61/hr, $p = 0.046$) and a lower percentage of NREM 3 sleep (FAPD: 20.13% $\pm$ 5.47%, control: 24.77% $\pm$ 6.94%, $p = 0.023$). During NREM 2 sleep, the FAPD group had significantly greater spindle density over frontal head regions than controls (FAPD: 2.80/min $\pm$ 1.39/min, control: 1.86/min $\pm$ 1.35/min, $p = 0.040$).

Conclusion: This study demonstrated that adolescents with FAPD have greater sleep spindle density, higher arousal indices, and lower proportions of slow wave sleep when compared to their peers. This may reflect an underlying difference in physiology which predisposes one to FAPD, or alternatively, may be secondary to pain symptoms themselves. Further investigation is warranted.

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0775

DIFFERENCES IN SUBJECTIVE SLEEP MEASURES IN MOTHERS AND FATHERS OF PREMATURE INFANTS: A PRELIMINARY STUDY

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Introduction: It has been documented that newborn's sleep is strongly associated with maternal and paternal sleep. However, mothers seem to be more affected by their infant's sleep than fathers. These associations are not well known in families of premature newborns yet. This was the objective of the present study.

Methods: 30 families of premature newborns (mothers, fathers and infants) participated in this study one month after discharge from the hospital. Parents completed, among other measures, sleep diaries during three consecutive weekdays for themselves and their child. Multiple linear regression analyses were computed to examine the association between sleep duration and nocturnal awakenings of the premature infant and their mothers' and fathers' sleep duration and number of awakenings during the night. Analyses were done separately for mothers and fathers.

Results: Regression models for parents' sleep duration were significant and explained 31.7% of the variance in mothers' sleep duration ($p = .009$) and 30.8% of the variance in fathers' sleep duration ($p = .01$). Infants' sleep duration was the only significant predictor in both models ($\beta = .663$, $p = .005$ and $\beta = .670$, $p = .005$, respectively for mothers and fathers). Thus, shorter sleep duration in premature infants predicted shorter sleep duration in mothers and fathers. Analyses of parents' nocturnal awakenings showed that the model was significant for mothers ($p < .001$), but not for fathers ($p = .372$). The variables explained 73.4% of the variance in mothers' awakenings, and infants' nocturnal awakenings was the only significant predictor ($\beta = .801$, $p < .001$).

Conclusion: Our results suggest that premature infants' sleep is strongly associated with mothers and fathers' sleep. In addition, it seems that nocturnal awakenings are particularly associated with the mothers, but not the fathers' awakenings during the night, which may be related to their involvement in feeding schedules during the night. Future studies should focus on sleep

disturbances in families of preterm infants and on interventions targeted for both mothers and fathers that can be implemented to improve sleep in this population.

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0776

EFFECTS OF PERCEIVED DISCRIMINATION ON SLEEP AND INTERNALIZING AND EXTERNALIZING BEHAVIORS IN HISPANIC/LATINX ADOLESCENTS

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Introduction: Racism negatively affects children's health, behavior, and relationships. Current literature focuses on associations between perceived discrimination and daytime behaviors in children and adolescents, with less known about associations with sleep behavior, an essential aspect on health during development. Racial/ethnic minorities, including Hispanic/Latinx youth, are at increased risk of sleep problems, along with mental health issues. Here, we examined the relationship between perceived discrimination and sleep and behavioral problems, and the potential role of familial cultural heritage connectedness as a mediator, in Hispanic/Latinx adolescents in the Adolescent Brain Cognitive Development (ABCD) Study®.

Methods: Data were analyzed from 1,213 Hispanic/Latinx adolescents (Mean age = 11.89 years, range: 10-14 years, 48.22% female), collected as part of the ongoing ABCD Study® from the 2nd year follow up. Sleep was assessed with a question about having trouble falling or staying asleep in the past two weeks from the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5) (youth-report). Participants completed the Perceived Discrimination scale, an 11-item self-report about racial/ethnic perceived discrimination in the past year from teachers, peers, and other adults. Cultural heritage connectedness was gathered from the Vancouver Index of Acculturation (caregiver-report). Internalizing and externalizing behaviors were assessed using the Child Behavior Checklist (caregiver-report). Regression models examined associations between perceived discrimination and sleep behavior and externalizing/internalizing behavior, considering age, socio-demographic characteristics, parental education, and familial immigration status.

Results: Perceived discrimination correlated with more sleep problems ($p < .01$), with a stronger effect in female than male participants ($p < .01$). Perceived discrimination was also associated with internalizing and externalizing behaviors ($p < .01$). Connectedness to cultural heritage partially mediated the association between perceived discrimination and externalizing behaviors ($p < .01$), but not with sleep problems or internalizing behaviors.

Conclusion: Results show perceived discrimination is associated with sleep problems in Hispanic/Latinx adolescents, with a stronger relationship in female participants. Future investigation of links between perceived discrimination and health outcomes, including sleep and behaviors, is needed using longitudinal data and youth self-reports of the Vancouver Index of Acculturation, rather than caregiver reports to further investigate the potential role of cultural connectedness in these relationships.

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0777**FEASIBILITY AND ACCEPTABILITY OF PERSONALIZED SLEEP HEALTH EDUCATION AS PART OF BED PROVISION FOR FAMILIES LIVING IN POVERTY**Mikayla Carson¹, Maja Dunnewald¹, Erin Lamanna¹, Kate Fay², Fiona Kyck², Jodi Mindell³, Ariel Williamson⁴¹ Saint Joseph's University, ² One House at a Time, ³ Saint Joseph's University/Children's Hospital of Philadelphia, ⁴ Children's Hospital of Philadelphia & University of Pennsylvania Perelman School of Medicine

Introduction: Socioeconomic sleep health disparities begin in childhood but there are few feasible and scalable community-based approaches to promote pediatric sleep health. This study aimed to determine community provider and family acceptability of community provider-delivered sleep health education.

Methods: Forty-four families (90% mothers) of children ages 8-12 years (Mage=9.9; 64% girls; 64% African American/Black; 23% Hispanic/Latinx) participating in an intervention condition of a randomized trial completed two personalized, telephone-based sleep health education sessions with a community provider. This intervention and the providers were part of a non-profit bed provision program for children without beds and living at or below 100% of the US poverty level. Data on feasibility from the community providers and treatment acceptability from the families were collected.

Results: Thirty-eight families (86%) completed both intervention sessions. The first session (n=38) averaged 15 minutes (SD=4 mins), while the second session (n=36) averaged 8 minutes (SD = 2.5 mins). Community providers indicated that the sleep health education delivery was feasible to implement, citing the easy integration into their typical program workflow (e.g., session 1 occurred during calls to schedule bed deliveries) as a key determinant of future sustainability. Providers also highlighted many positive experiences, noting that the sleep health discussions helped them to get to know program participants better. In terms of intervention acceptability, 87% of families agreed/strongly agreed that "overall, [they had] a positive reaction to these strategies," and 81% agreed/strongly agreed that "[they] found these strategies to be an acceptable way of helping [their] child sleep." In addition, 87% agreed/strongly agreed they would use the sleep strategies if they wanted to change their child sleep habits in the future, 84% liked the strategies they learned, 84% believed the strategies were effective, and 90% reported the strategies were likely to result in permanent sleep improvements.

Conclusion: Overall, a community provider-delivered sleep health education was highly feasible for providers, with strong intervention retention and excellent caregiver acceptability ratings. Training community providers to deliver sleep health education is a promising strategy for disseminating evidence-based sleep health information on a larger scale and promoting pediatric sleep health equity.

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0778**FUNCTIONAL THALAMO-CORTICAL CONNECTIVITY RELATES TO SLEEP-ONSET PROBLEMS IN EARLY INFANCY**Emily Chiem¹, Lauren Wagner¹, Joshua Ceballos¹, Mirella Dapretto¹¹ University of California, Los Angeles

Introduction: Healthy sleep patterns are crucial for proper brain development in infancy. However, little is known about the relationship between early sleep disturbances and functional brain connectivity. The thalamus plays a critical role in the regulation of sleep and wakefulness, and undergoes rapid growth in the first year. Therefore, we examined how early thalamic connectivity relates to sleep-onset problems during the first 6 months of life.

Methods: All data were collected as part of the Baby Connectome Project (1U01MH110274). Forty-six infants (between 3-5 months old) underwent resting-state fMRI scans during natural sleep. The fMRI data were preprocessed and analyzed using FSL, and the bilateral thalamus was used in seed-based analyses. The Infant Behavior Questionnaire (IBQ) was used to create a measure of sleep initiation. Five IBQ items (21-25) were reverse-scored and averaged to generate the Infant Sleep-Onset Problems (ISOP) score, with higher scores indicating longer sleep latencies. ISOP scores across 3-6 months were used as regressors in whole-brain analyses.

Results: Preliminary results suggest a positive correlation between ISOP scores and connectivity between the thalamus and precuneus, such that greater sleep-onset problems were associated with stronger connectivity between the thalamus and precuneus. In contrast, there was a negative correlation between ISOP scores and connectivity between the thalamus and anterior cingulate cortex, such that fewer sleep-onset problems were associated with stronger connectivity between the thalamus and anterior cingulate cortex.

Conclusion: Our findings suggest that stronger thalamic connectivity with the precuneus, a region involved in the perception and integration of information, is related to greater sleep initiation difficulties. In contrast, stronger connectivity between the thalamus and anterior cingulate cortex, a region involved in attention allocation and emotional regulation, is associated with less sleep initiation problems. While these results are preliminary, they indicate that early sleep problems are associated with altered development of functional thalamo-cortical networks.

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0779**IMPACT OF 8-H TIME LIMITED EATING ON SLEEP IN ADOLESCENTS WITH OBESITY**Archana Jayakumar¹, Alaina Vidmar¹, Emily Gillett¹, Choo Phei Wei¹¹ University of Southern California

Introduction: Time-based interventions, such as time-limited eating (TLE), have become a promising dietary strategy in adults with obesity. TLE involves shortening the daily eating window to a pre-specified number of hours and fasting for the remaining hours of the day without altering diet quality. No study to date

has examined the impact of TLE on sleep quality in adolescents with obesity.

Methods: We conducted a secondary analysis of a 12-week pilot study that compared TLE (8-h eating window/16-h fasting window) to a prolonged window (12-h eating window/12-h fasting window) in adolescents with obesity (ages 14 to 19, 72% female, 74% Hispanic). All youth completed the Pittsburgh Sleep Quality Index (PSQI) at baseline ($n = 42$), weeks 4 ($n = 43$), and 12 ($n = 42$). The seven component PSQI score, develops a global score that ranges from 0 to 21, where higher scores indicates worse sleep. Glycemic profiles were captured via continuous glucose monitors (CGM) worn for the duration of the study. Mixed effects generalized linear model in log scale and ordinal logistic regression models were utilized to (a) examine the change in PSQI total score and (b) assess the association between glycemic variability and PSQI total score overtime by intervention arm.

Results: Across all youth included in this analysis ($n = 43$), there was improvement in PSQI total score at week 12 compared to baseline that was marginally significant after adjusting for multiple testing (% change = -19.60, 95%CI = -31.83 to -5.18, $p = 0.057$). The median PSQI score for the TLE group ($n = 29$) was 6 at week 0 (5 to 10) and 5 at week 12 (2.5 to 7), suggesting sleep quality improved. The changes in PSQI total score, sleep ratio, and sleep onset score over the course of study were not statistically different between groups ($p > 0.05$). There was no significant association between glycemic variability and PSQI score between the groups.

Conclusion: Findings from this secondary analysis indicate that TLE does not negatively alter sleep quality or duration in adolescents with obesity. The potential effects of TLE on sleep should be further investigated in larger randomized trials.

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0780

IRON SUCROSE INFUSIONS FOR PEDIATRIC SLEEP RELATED MOVEMENT DISORDERS

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Introduction: Sleep related movement disorders (SRMD) such as restless leg syndrome (RLS), periodic limb movement disorder (PLMD), and restless sleep disorder (RSD) are common diagnoses among children referred to pediatric sleep clinics, particularly among children with neurodevelopmental disorders such as ASD. These disorders have been associated with low iron status, and evidence demonstrates clinical response to iron supplementation. Oral iron supplementation is often used as a first step in management, although some children do not manifest an adequate response in serum ferritin levels, or do not tolerate oral iron due to side effects or taste. For these children, iron infusions may be an attractive therapeutic strategy.

Methods: We performed a retrospective chart review of children referred for iron infusion between January 2021 to November 2022 at Kaiser Permanente Northern California Pediatric Sleep Clinics. Children carried a diagnosis of RLS, PLMD, or RSD. Iron sucrose was used, with a target dose of 6-7mg/kg, with a maximum dose of 200mg per infusion. We reviewed the number of infusions, pre- and post-infusion ferritin levels, and clinical

response based on clinic notes and/or secure message communication after infusion.

Results: A total of 11 children were identified who received at least one iron infusion. Mean age at time of first infusion was 7.2 (4.5) years, 63.6% were male, and 45.5% were diagnosed with ASD. The most common diagnosis was PLMD (54.5%), followed by RLS (27.3%), and RSD (18.2%). Mean infusion dose of iron sucrose was 130.5mg (41.6) and children received an average of 2.0 (1.1) infusions. Mean ferritin prior to infusion was 30.1 (20.1) and 62.6ng/mL (41.1) post infusion. Based on chart review, 63.6% of families reported symptomatic improvement following iron infusions. No children were reported to have worsening of sleep or significant side effects following iron sucrose infusion.

Conclusion: Iron infusions are an effective strategy for management of sleep related movement disorders who are recalcitrant to oral iron. This can be an especially attractive therapeutic option in children with neurodevelopmental disorders such as ASD. Further research exploring optimal dosing and formulation of iron is warranted.

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0781

RELATIONSHIP BETWEEN BEDTIME ROUTINES WITH SLEEP, DEVELOPMENT, AND PARENTING STRESS IN TODDLERS

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Introduction: Institution of a nightly bedtime routine is a key component of sleep health and is likely to foster positive early childhood development. The current study investigated the longitudinal and concurrent relationships between a bedtime routine and sleep, social-emotional development, and parenting stress in toddlers living in lower income homes and/or neighborhoods.

Methods: Caregivers of 78 toddlers (56.4% female; $M = 12.87$ mos; 67.9% Black; 73.1% WIC) reported on their child's bedtime routine at their 12-month well-child visit. At their child's 15- and 24-month well visit, caregivers completed the Brief Infant Sleep Questionnaire-Revised (BISQ-R SF), the Brief Infant-Toddler Social and Emotional Assessment (BITSEA), the communication and personal-social subscales of the Ages and Stages Questionnaire (ASQ), and the Parenting Stress Index (PSI-SF). Results were considered significant at $p < .05$.

Results: Toddlers with a consistent bedtime routine (5+ nights per week) at 12 months had significantly earlier bedtimes (20:54 vs 21:24) and waketimes (7:21 vs 8:48) at 24 months compared to those without a consistent routine. At 15 months, a more frequent bedtime routine was associated with fewer concurrent social-emotional problems ($r = -.32$) and decreased bedtime difficulty ($r = -.34$). At 24 months, toddlers with a consistent bedtime routine (33.3%) were less likely to exhibit concurrent BITSEA social-emotional competency concerns (66.7%). Caregivers also reported better nighttime sleep in toddlers with a consistent routine at 24 months. Additionally, caregivers whose child had

a consistent routine at 15 and 24 months perceived their child as less difficult (PSI) at 24 months. However, no associations emerged between bedtime routine frequency and consistency at 12, 15, and 24 months with ASQ communication and personal-social concerns.

Conclusion: Bedtime routine frequency and consistency in toddlers was associated with better caregiver-perceived sleep, social-emotional development, and lower parental stress regarding their child being perceived as difficult, but not communication and personal-social concerns. A bedtime routine may be a cost-effective strategy to promote toddlers' sleep, overall development, and family's functioning.

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0782

SLEEP AND ITS DISTURBANCE IN PARENTS OF CHILDREN AND ADOLESCENTS WITH EPILEPSY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Sleep disturbances are commonly reported by parents of children and adolescents with epilepsy. However, evidence synthesis including quality and quantity of sleep in parents of children and adolescents with epilepsy is lacking. A greater understanding of the characteristics of sleep patterns and sleep problems in parents of children with epilepsy is needed because when the sleep of the parents is compromised, the parents' ability to provide quality care for the child may be hampered. The purpose of this systematic review and meta-analysis was to synthesize published studies examining sleep and its disturbance in parents of children and adolescents with epilepsy.

Methods: Five electronic databases, PubMed, Medline, Embase, PsychINFO, and CINAHL, were systematically searched from inception to September 2021. Studies examining parents or caregivers of pediatric patients aged < 18 years with epilepsy using a quantitative measure of sleep duration, sleep quality, or sleep disturbance were included. Available data were pooled using random-effects or fixed-effects models on the basis of heterogeneity between studies.

Results: Eleven observational studies with a total of 934 parents of children and adolescents with epilepsy were reviewed. The pooled nocturnal sleep duration was only 5.93 hours (95% CI: 4.64 to 7.21 hours). Overall sleep quality as estimated by the bias-adjusted pooled Pittsburgh Sleep Quality Index total score was 6.65 (95% CI: 5.98 to 7.33). Parents of children with epilepsy had significantly higher Pittsburgh Sleep Quality Index total scores in comparison to parents of healthy children (differences in means: 1.84, 95% CI: 1.29 to 2.39). The pooled estimated prevalence of parental sleep disturbances was 58.1% (95% CI: 45.7% to 69.6%).

Conclusion: Our findings demonstrate a high prevalence of sleep disturbances with poor sleep quality and substantial reductions in sleep time in parents of children and adolescents with epilepsy. Healthcare professionals in pediatric neurology clinics should initiate screening of sleep disturbances in parents and refer parents to a sleep specialist when necessary.

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0783

SLEEP CONTINUITY AND QUALITY IN ADOLESCENTS WITH FUNCTIONAL ABDOMINAL PAIN

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Introduction: Functional Abdominal Pain Disorders (FAPD), in which chronic abdominal pain occurs independently of organic pathology, are common in adolescents. FAPD can lead to significant impairment in daytime function and may overlap with sleep disorders. Though several studies have explored the nature of sleep disturbances experienced by adolescents with FAPD, none have characterized differences in sleep architecture in this population.

Methods: Adolescents (age 11-18 years) with FAPD and age/gender-matched controls were prospectively recruited to undergo polysomnography (PSG). PSG was performed according to AASM guidelines, scored by a registered sleep technologist, and interpreted by a board-certified sleep physician. The first four hours of artifact-free NREM sleep were analyzed using fast Fourier transformation with Welch tapered windows of 1024 samples (and 50% overlap) averaged over 30-second epochs. Total power was calculated for very low (0.3 – 1 Hz), delta (1 – 4 Hz), theta (4 – 8 Hz), and alpha (8-12 Hz) frequencies. Comparisons between groups were made using Wilcoxon rank sum tests or t-tests for non-normal and normal data, respectively.

Results: A total of 41 subjects were recruited (FAPD n=21, control n=20). The FAPD group had a greater arousal index and a lower percentage of NREM 3 sleep when compared to the control group (FAPD arousals: mean=10.08/min $\pm$ 4.89 min, control arousals mean=7.31/min $\pm$ 3.61/min, $p = 0.046$), FAPD NREM 3: mean=20.13% $\pm$ 5.47%, control NREM 3: mean=24.77% $\pm$ 6.94%, $p = 0.023$). Delta power was significantly lower in the FAPD group compared to controls (FAPD Delta mean=488.67 μ V2 $\pm$ 282.82 μ V2, control Delta mean=1193.14 μ V2 $\pm$ 663.89 μ V2, $p < 0.001$).

Conclusion: This study demonstrates significant differences in sleep architecture of adolescents with FAPD compared to their peers. In particular, decreased proportions of NREM 3 sleep and lower Delta power are indicative of diminished slow wave sleep (SWS). Reductions in SWS may be indicative of common neurotransmitter pathways shared between sleep and chronic pain syndromes, or secondary to sleep disruption associated with pain. Further research is indicated.

Support (if any): This research is supported by the Cincinnati Children's Research Foundation and the Summer Medical Student Respiratory Research Fellowship program at Cincinnati Children's.

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0784**SLEEP DISRUPTORS ON THE INPATIENT PEDIATRIC UNIT**Daniela Uribe¹, Seema Rani², Aaron Chidekel¹, Abigail Strang¹¹ Nemours Children's Hospital, ² Thomas Jefferson University

Introduction: High quality sleep is crucial to health and development in children. Compared to healthy children, hospitalized children have a higher chance of experiencing disrupted and poor-quality sleep, which may thereby impede their recovery. There is lack of research around sleep disruptors in hospitalized children outside of the ICU setting.

Methods: This IRB approved, prospective, survey-based study was completed in 2022 and included children ages 8-17 years who were hospitalized ≥ 3 days on the inpatient (non-ICU) units at Nemours Children's Hospital, Delaware. The study was comprised of four surveys: The Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD, higher scores= more sleepiness), Adolescent and Children's Sleep Hygiene Scales based on age (ASHS and CSHS, Higher Scores= Better Sleep Hygiene), Consensus Sleep Diary, and the Nemours Sleep Disruptors Questionnaire (NSDQ) which evaluated contribution of various factors to sleep disruption. The EMR was reviewed for demographic and clinical information. Descriptive and comparative statistics were performed.

Results: Study participants (n=45) were 40% male, 57.8% white, with a mean age of 13.4 years. The mean number of nighttime awakenings was 2 (range=0-7). The average total sleep time was 8.2 hours (range=5-12). Vital signs were obtained between 10PM and 6AM for 87% of participants. On the administered surveys, participants scored: ESS-CHAD (M=8.6 SD=4.3), ASHS (M=2.9 SD=.8), CSHS (M=3.3 SD=.6). 54% of patients reported feeling like they needed more sleep. On the NSDQ, the most disruptive factors noted by patients (causing at least mild sleep disruption) were alarms on equipment (69%), vital signs (64%) and environmental noise (62%).

Conclusion: In this cohort of hospitalized children, sleep environment (specifically related to alarms, environmental noise, and vital signs) was a leading cause of sleep disruption. Further interventional studies are needed to examine the relationship between sleep quality and sleep-friendly hospital environments, with vital signs and physiologic monitoring as potential targets for intervention.

Support (if any):

Abstract citation ID: zsad077.0785

0785**SLEEP HABITS AND SLEEP HYGIENE PRACTICES OF SOUTH AFRICAN PRIMARY SCHOOL-AGED CHILDREN: AN EXPLORATORY STUDY.**Tanya Wood¹, Nadine Rampf¹¹ Stellenbosch University

Introduction: Insufficient sleep adversely affects the physiological and psychological well-being of children and their families. Reports indicate that children's sleep health is declining; however, comparable data on the South African pediatric population is lacking. To this end, the current study aimed to explore the sleep quality and sleep hygiene practices of South African primary school-aged children.

Methods: The current study was exploratory and employed convenience sampling. Parents/legal guardians of South African children (6 – 11 years) attending primary school were recruited through social media platforms and asked to complete an online survey. The survey captured basic biographical information on their child's sleep habits (Children's Sleep Health Questionnaire, CSHQ) and sleep hygiene practices (Children's Sleep Hygiene Scale, CSHS). Survey responses were collected from May–August 2022.

Results: Of the 448 responses, 208 were included in the data analysis. Responses were received from eight South African provinces; the highest response was from the Western Cape (38.5%), followed by Gauteng (30.3%). The mean age of the study population was 8.0 ± 1.7 years (mean $\pm$ SD) and 51% were female. Of the children surveyed, 49.5% attended government schools. The mean parental report of sleep duration was 9.31 ± 0.45 hrs. The mean total sleep disturbance score based on the CSHQ was 47 ± 8.4 , with 76% of children scoring greater than or equal to 41, indicating the presence of a possible sleep disturbance. The mean sleep hygiene index was 28.0 ± 3.4 . Linear regression analysis revealed a significant correlation between total sleep disturbance and sleep hygiene scores ($R^2 = 0.32$, $p < 0.001$); low sleep hygiene index scores were associated with a higher total sleep disturbance score. Multiple quantile regression models revealed that home-schooling and increased age were also significantly associated with sleep disturbance scores.

Conclusion: While the reported total sleep time for South African primary school-aged children was within the recommended range (9 – 11 hrs) for this age group, the overall presence of possible sleep disturbances was high, which could be attributed to poor sleep hygiene practices.

Support (if any):

Abstract citation ID: zsad077.0786

0786**SLEEP PROBLEMS AND ASSOCIATIONS WITH MENTAL HEALTH AMONG CHILDREN RECENTLY ADOPTED FROM FOSTER CARE**Karolina Rusin¹, Anthony Cifre¹, Candice Alfano¹¹ University of Houston

Introduction: Trauma and early adversity are known to increase risk for both sleep and psychological disturbances, placing children who spend time in foster care at a higher risk for these problems than other populations of youth. Recent research has shown most children in foster care experience impairing sleep problems, but little is known of whether and how these problems relate to longer-term mental health. Thus, among a large sample of children recently adopted from foster care, we examined the prevalence of sleep-related problems when children were first placed in the foster home and their associations with current mental health problems.

Methods: N=234 parents of children, 4–11 years (M=5.94, SD=1.97) adopted from foster care in the U.S. within the past two years completed an online survey about their children's sleep and mental health. Participants were recruited through private social media groups for foster, kinship, and/or adoptive caregivers. Parents were asked to report the specific types of sleep-related problems children exhibited at time of first arrival in home and completed validated measures of child anxiety and depressive symptoms regarding their child's current functioning.

Results: After first arriving in the home, 82.9% of children were reported to experience at least one sleep-related problem. Further, 58.5% were reported to experience nighttime awakenings, 37.2% exhibited fear of the dark, and 32.1% had trouble sleeping alone. Approximately one quarter of children wet the bed (27.8%), struggled with staying in bed (27.8%), experienced nightmares (26.1%), and/or had night terrors (22.6%). Total number of sleep-related problems was significantly positively correlated with child age ($r(234) = .30, p < .001$), as well as current separation anxiety ($r(234) = .16, p < .05$), generalized anxiety ($r(234) = .33, p < .001$), and depressive symptoms ($r(234) = .23, p < .001$).

Conclusion: Our findings align with previous reports indicating high rates of sleep-related problems among youth in foster care and further suggest that these early problems may be a harbinger for mental health problems even after children achieve permanence. Findings call for greater attention toward sleep health among children in foster care and other alternative care settings.

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0787

SLEEP PROBLEMS AND SLEEP DISORDERS IN CHILDREN WITH RUBINSTEIN-TAYBI SYNDROME

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Introduction: Rubinstein-Taybi syndrome (RSTS) is a genetic condition which characterized by distinctive facial features, broad and angulated thumbs and halluces, short stature, and moderate-to-severe intellectual disability. Sleep problems have been reported in children with RSTS. However, most studies were case reports in adult population. There is limited information on details about sleep problems in children with RSTS. The purpose of this study was to: (1.) Describe the demographics, clinical presentation of children with RSTS; (2.) Describe polysomnographic findings, sleep diagnoses and treatments of children with RSTS.

Methods: A retrospective study was performed in patients with RSTS (ages 0-20 years) who underwent polysomnography at Cincinnati Children's Hospital Medical Center from January 1, 2000 to October 31, 2022. Demographics, clinical presentation, polysomnographic findings, diagnoses and treatments were reviewed. Descriptive statistics were utilized.

Results: Thirteen children with RSTS were included, 69% were male (N=9). The median age was 6.3 years (range 13 days to 12.6 years). The most common presenting symptoms included snoring (N=9, 69.2%), pauses of breathing (N=6, 46.2%) and nighttime awakenings (N=5, 38.5%). The age of onset of sleep symptoms ranged from birth to 5 years. From polysomnographic findings, the most common diagnosis was obstructive sleep apnea (OSA) (N=11, 84.6%) with obstructive apnea-hypopnea index ranging from 2.8 to 72.7/h, (mild, N=3; moderate, N=3; severe; N=5). All children with mild OSA (N=3) were treated with medications, while children with moderate-to-severe OSA were managed with PAP therapies (N=4), supplemental oxygen (N=3), and surgeries (N=3). Other diagnoses included central sleep apnea (N=2) and periodic limb movement disorder (N=2),

which were treated with supplemental oxygen and iron supplements, respectively.

Conclusion: The most common presenting sleep symptoms in children with RSTS were snoring, pauses of breathing and nighttime awakening. The age of onset of symptoms was variable, but usually occurred during infancy through childhood. OSA was the most common diagnosis in these populations. Physicians should recognize the early signs and symptoms of sleep problems in children with RSTS to allow early diagnosis and appropriate treatment.

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0788

SLEEP PROFILE OF ADOLESCENTS FOLLOWING POSTERIOR SPINAL FUSION

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Introduction: Major musculoskeletal operations can have a prolonged impact on patients' quality of life during the postoperative period. Sleep patterns can be affected by general anesthesia, complex and prolonged operations, and post-surgical care. Sleep disturbance can be considered a determinant of poor postsurgical outcomes. In this study, we examined the sleep profile of adolescents who underwent Posterior Spine Fusion (PSF) utilizing the FitBit Charge 4TM wearable device.

Methods: Patients were approached at the time of their evaluation in the orthopedic office once they had been scheduled for PSF. Patients received a Fitbit Charge 4TM at the time of enrollment. Total sleep time (TST), the duration of REM and Deep Sleep phases, and sleep efficiency were obtained from patients' FitBit4 data and were calculated by averaging data recorded over a 2-4-day period during the week prior to surgery, during the hospital stay, one-two-three weeks, and 3 months after patients were discharged home. Patients were given a PROMIS sleep questionnaire delivered to their cellular phone using Qualtrics the week before the hospitalization, during hospitalization, and 3 months after surgery. Pain scores were obtained every 4-6 hours during the patient's hospital stay using the self-reporting numeric scale.

Results: 16 patients (10 female (62%)) completed the 3 months study period. Mean age was 16±1.9 years. The average length of hospitalization was 3 days. The average TST, REM, and DEEP sleep at baseline was 387±111, 74±28, 75±25 minutes respectively. TST, REM, and DEEP sleep decreased during the acute post-operative period and gradually increased during the follow-up period going to baseline values by the 3rd post-surgery week in 72% of the cases. Perception of sleep showed mild disturbance at baseline and worsened during the hospital stay based on PROMIS scores with improvement or return to baseline by the 3rd month post-operatively in 86% of patients.

Conclusion: Sleep phases of adolescents are affected after a major surgery. Similar to patients of other major surgeries, these changes are short-lived and returned to baseline by the 3rd post-operative week. There was a broad range of changes among subjects during the study period.

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0789

SLEEP SPINDLE DENSITY IS ASSOCIATED WITH CORE SYMPTOM SEVERITY IN AUTISM SPECTRUM DISORDER

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Introduction: Converging evidence suggests that dysregulation of thalamocortical interactions, mediated by the thalamic reticular nucleus (TRN), contributes to the expression of autism spectrum disorder (ASD). Risk genes for ASD have been found to affect the TRN early in development. Two hallmarks of NREM sleep—slow oscillations (SO) and sleep spindles—reflect TRN function and distinct thalamic/thalamocortical circuits. While studies demonstrate disrupted sleep quality that correlates with symptoms in children with ASD, studies of spindles in ASD have produced inconsistent findings. It is yet unclear if and how spindle properties are associated with ASD symptoms. Herein, based on studies implicating TRN-mediated thalamocortical dysregulation in ASD, we hypothesized that 1) sleep spindles are reduced in ASD; 2) spindle abnormalities correlate with worse clinical symptoms and cognition.

Methods: Forty participants with ASD (32 males, age: 11.8 ± 3.2 ; range 6-15) and 46 typically developing (TD) controls (32 males, age: 11.2 ± 2.3 ; range 6-15) participated in the study. All participants underwent ambulatory overnight polysomnography (PSG) for sleep assessment after systematic desensitization. The Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview-Revised (ADI-R) were used to assess core behavioral symptoms.

Results: Spindle density was significantly lower in ASD compared to TD participants (ASD: 2.5 ± 2.0 ; TD: 3.0 ± 2.1 ; $d = 0.45$, $p = 0.01$). In the ASD group, less spindle density was associated with more severe behavioral symptoms, as measured by the total ADOS score ($R^2 = 0.15$, $p = 0.01$) and the three main subscales of the ADI-R (reciprocal social interaction: $R^2 = 0.22$, $p = 0.002$; communication and language: $R^2 = 0.19$, $p = 0.003$; and restricted and repetitive, stereotyped interests and behaviors: $R^2 = 0.14$, $p = 0.01$).

Conclusion: Alterations in the maturational trajectory of spindles are related to the core symptoms of ASD individuals. The results have the potential to identify novel biomarkers that index distinct aspects of ASD pathophysiology and point to multiple neural mechanisms underlying disease heterogeneity. The study may contribute to producing novel evidence to elucidate the bidirectional relationship between sleep and ASD.

Support (if any): Simons Foundation Autism Research Initiative grant (177986).

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0790

SLEEP, EARLY SOLID INTRODUCTION, AND ALLERGIC DISEASE IN INFANCY

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Introduction: Early complementary (solid) food introduction (< 6 months) is at times recommended to reduce the risk of allergic disease, specifically food allergy. However, little is known about solid food introduction and allergic disease as they relate to sleep problems during infancy. Thus, the purpose of this study was to assess the association of sleep problems with early solid food introduction and allergic disease during the first year of life.

Methods: Mothers of 300 infants (0-11.9 mos, $M = 5.87$) completed an online questionnaire about infant sleep, solid food introduction (non-milk, -juice, -formula), and allergic disease (including atopic dermatitis, itchy/dry skin, food allergies). Prevalence of sleep problems was compared in the context of presence or absence of early solid food introduction and allergic disease, using chi-square.

Results: Overall, 29.3% of infants were reported to have a sleep problem, 29.0% atopic dermatitis and/or itchy/dry/flaky (AD/IDF) skin, and 10.7% food allergies. Of infants who were 6 months or older at the time of the study, 24.4% were introduced to solids early (< 6 months). Those infants with early solid food introduction were less likely to have a reported sleep problem (19.5%) compared to those introduced to solids starting at 6 months or later (37.8%), $p < .05$. For all infants, sleep problems were more likely to be reported in association with AD/IDF than those without those skin conditions (39.1% vs 25.4%), $p < .05$. No statistically significant differences were found in sleep problem rates between those with a food allergy (40.1%) and those without a food allergy (28.0%), $p > .05$.

Conclusion: Overall, lower sleep problem rates were associated with early introduction (before 6 months) of solid foods. Presence of sleep problems was associated with reports of atopic dermatitis and itchy/dry/flaky skin. Sleep problems were unrelated to food allergies, although overall rates of food allergies were low in this study.

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0791

THE ASSOCIATION OF SLEEP WITH DEVELOPMENTAL AND BEHAVIORAL FACTORS IN PREMATURE INFANTS

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Introduction: Children with neurodevelopmental conditions often experience sleep problems. Whereas sleep is a predictor of behavioral outcomes in children, there is limited evidence regarding sleep as an indicator of neurodevelopmental concerns.

This study examined the prevalence of sleep issues and neurodevelopmental conditions in children with a history of prematurity, as well as the role of sleep as a potential indicator for future developmental and behavioral concerns.

Methods: Electronic health records of 57 young children (M = 31.9 gestational weeks, range = 23 to 40 weeks; 35.1% girls) presenting to a neonatal follow-up clinic were reviewed. Caregivers completed the Brief Infant Sleep Questionnaire (BISQ-R) between 6-16 corrected months (Mage = 11.6 mos) and then completed the Modified Checklist for Autism in Toddlers (M-CHAT) between 16-26 corrected months (Mage = 20.9 mos). Caregivers also completed the Survey of Wellbeing of Young Children (SWYC; n = 56; Mage = 20.9 mos) and the Brief Infant-Toddler Social and Emotional Assessment (BITSEA; n = 32; Mage = 17.4 mos).

Results: Approximately one-quarter (26.3%) of subjects had a caregiver-perceived child sleep problem at ages 6-16 corrected months. A total of 40.4% of children had clinically significant autism concerns on the M-CHAT and 67.9% had clinically significant concerns on the SWYC. Subsequent caregiver ratings showed that 25.0% of children exhibited challenging behaviors and 34.4% lower social-emotional competency on the BITSEA. Children who demonstrated clinically significant autism risk on the M-CHAT were more likely to have a prior caregiver-identified child sleep problem. Those who later failed the M-CHAT also had increased night waking frequency (2.43 vs 1.82 wakings) earlier in development. Logistic regression indicated that caregiver-identified sleep problems significantly predicted subsequent challenging behaviors on the BITSEA but not later neurodevelopmental concerns on the SWYC or social-emotional competencies on the BITSEA.

Conclusion: These pilot data suggest that a caregiver-identified child sleep problem at age 6-16 months corrected is linked to more frequent challenging child behaviors in toddlerhood (16-26 corrected months). Caregiver-identified child sleep problems and more night wakings also predicted later neurodevelopmental concerns. Sleep problems in premature infants may thus be an early indication of later behavioral and neurodevelopmental issues.

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0792

TIGERCHAT: A SCHOOL-BASED HEALTH EDUCATION PROGRAM PROMOTING WELLNESS AND SLEEP HEALTH IN A RURAL COMMUNITY

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Introduction: There is increasing awareness of the importance of sleep for overall health and wellness in children. However, many children are still not getting the recommended hours of sleep necessary for optimal school functioning. The purpose of this project is to describe a school-based health education program (TigerCHAT) and identify common barriers to sleep in 10-11 year old students.

Methods: TigerCHAT is a school-based health education program for children K-6th grades. It focuses on 45-minute sessions addressing various health topics, including sleep. Data are collected after parental consent approved. It was implemented in a rural elementary school in Alabama in the fall of 2018. Eighty-two nursing students over 10 weeks led small groups of students

in brief educational modules, including one on sleep, during their scheduled gym period. Before education began, 5th and 6th grade students (10-11 years old) filled out a 22 question "What Keeps Me From Sleeping Well" Questionnaire modified for children from the Sleep Environment Inventory that asked students to circle yes/no/NA.

Results: Frequencies and percentages were run on the data to determine common reasons for disrupted sleep. Children ages 10-11 years in 5th and 6th grade (n=363, 47% female, 53% male, 45.3% Black, 50.8% White, 0.4% Hispanic, 1.5% Asian or Pacific Islander, 68% classified as economically disadvantaged) in a rural elementary school filled out questionnaires. The most frequently cited reasons for not sleeping well included: Noise inside the house (55%, n=198); Room too hot or cold (50%, n=181); Phone calls or text messages during the night (49%, n=176); Needed to go to the bathroom (49%, n=177); The TV, radio, or computer was on (44%, n=160); and Worried about my family (41%, n=149).

Conclusion: Students in this sample overwhelmingly endorsed environmental disrupters as reasons for not sleeping well (temperature of room, presence of noise, phone/technology in room), rather than other stressors on the questionnaire (worry about grades, worry about friends) or physical factors (stomach ache). Environmental factors such as the use of phones and social media should be examined further in this population, as it may be a significant, and potentially modifiable, reason for poor sleep in school age children.

Support (if any):

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0793

EFFECT OF SLEEPING POSITION ON OBSTRUCTIVE SLEEP APNEA IN CHILDREN UNDERGOING POLYSOMNOGRAPHY

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Introduction: Obstructive sleep apnea (OSA) in children is characterized by partial or complete upper airway obstruction during sleep, associated with gas exchange abnormalities and disrupted sleep with well-recognized neurobehavioral, neurocognitive, cardiovascular consequences. Positional obstructive sleep apnea (POSA) is defined as a lower AHI (by 50%) in the non-supine position than in the supine position. POSA has been well described in adults, affecting about 55% of adults with OSA. This occurs because airway collapse is maximal in the supine position compared to lateral or prone positions in this subset of patients with significant reduction in airway dimension occurring antero-posteriorly compared to circumferential reduction in airway dimension. However, POSA has not been well studied in children.

Methods: In this single center retrospective study, data was collected from one hundred consecutive polysomnographic studies from children (6-18 years) with moderate and severe OSA. Mean age was 10.7 years with 50% males in our cohort. Regression analysis was performed to study the relationship of sleeping position with the following variables: Age, sex, BMI, neck circumference, AHI, and desaturation index (DI) in supine and non-supine positions.

Results: 60% of the patients in our study had significantly lower (by 50%) AHI and DI in non-supine position. This effect was seen in both moderate and severe OSA, though the effect was

higher with increasing AHI and BMI. The effect of sleeping position persisted even when corrected for time spent in each position.

Conclusion: Most of the children in our cohort showed significant reduction in OSA in non-supine sleeping position. Positional therapy (PT), being a low-cost and non-invasive intervention is a reasonable approach in patients who demonstrate differences in AHI, oxygenation, and ventilation. Identifying the OSA phenotype and the subset of OSA patients likely to benefit from non-supine position increases the success of PT. PT may be helpful in situations where adenotonsillectomy may not be indicated and CPAP may not be well tolerated, not desired by the patient, and/or not sufficient to improve OSA. We intend to perform further analysis to study the effect of position on gas exchange and identify the phenotype who may benefit from PT in a larger cohort.

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0794

EFFECT OF SURGICAL OSA TREATMENT ON PERIODIC LIMB MOVEMENTS OF SLEEP IN PEDIATRIC PATIENTS

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Introduction: The relationship between obstructive sleep apnea (OSA) and periodic limb movements of sleep (PLMS) is not completely understood, especially among pediatric patients. Previous research describes varied changes in PLMS following OSA treatment, including increased, decreased, or unchanged PLMS frequency. This study aimed to evaluate the effect of surgical OSA treatment on the periodic limb movement index (PLMI) in pediatric patients with OSA and significant PLMS.

Methods: Retrospective chart review was performed to identify pediatric patients who had polysomnography demonstrating significant PLMS (PLMI ≥ 5 /hour) and OSA (obstructive apnea-hypopnea index (OAH) ≥ 1.5 /hour) that was treated with upper airway surgery. Patients aged 1-18 years were included if significant PLMS was present on either pre-treatment or post-treatment polysomnograms between 1/1/2010 and 7/31/2022. Patients were evaluated for changes in PLMI and OAH between a pre- and post-treatment polysomnogram, each obtained within 12 months of OSA treatment. Patients with inadequate sleep time (< 2 hours) were excluded. Data are reported as mean $\pm$ standard deviation and results from mixed effect linear models.

Results: Medical record review identified 198 patients. The average age was 5.3 ± 3.8 years (range 1.1-16.9 years) at pre-treatment polysomnogram, including 129 (65.2%) male patients. Adenotonsillectomy was the most common OSA treatment ($n=136$). For the whole group, the OAH decreased from 12.3 ± 15.3 to 5.3 ± 8.1 /hour and the PLMI increased from 5.5 ± 8.5 to 7.0 ± 8.7 /hour after treatment, for an average PLMI increase of 1.5/hour (SE=0.7, $p=0.04$). Sub-group analysis of patients with decreased OAH following treatment ($n=152$) showed an average PLMI increase of 2.3/hour (SE=0.8, $p=0.004$), while patients with increased OAH following treatment ($n=44$) did not show a significant change in PLMI. There were 74 patients (37.4%) who developed significant PLMS following treatment and 36 patients (18.2%) with significant PLMS before and after treatment.

Conclusion: Effective OSA treatment led to increased PLMI among a majority of children, highlighting the potential for unmasking of PLMS in some pediatric patients with OSA. Furthermore, over one third of patients developed polysomnographic criteria for significant PLMS after OSA management. This may suggest a sub-group of children with OSA who have a PLMD phenotype that may not become apparent until appropriate OSA treatment.

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0795

IMPLEMENTATION OF THE PEDIATRIC CRANIOFACIAL SCREENING TOOL FOR SLEEP DISORDERED BREATHING (PCSS): AN OBSERVATIONAL PILOT STUDY

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Introduction: Pediatric sleep-disordered breathing (SDB) is highly prevalent and associated with craniofacial risk factors not routinely assessed. We developed the Pediatric Craniofacial Screening Tool for Sleep (PCSS) to assess which craniofacial risk factors are closely correlated with SDB symptoms in children.

Methods: Pilot study of children ages 5-12y recruited from eight dental sites across the country to participate in the PCSS screening by dental providers. The primary outcome was SDB measured by the validated PSQ-SRBD questionnaire (22 items, range 0-1, and >0.33 signifying increased SDB risk). The predictors included PCSS total score and individual items comprising of 21 craniofacial features. Neighborhood socioeconomic status (NSES) was characterized by using the Area Deprivation Index (ADI). Correlation and regression analyses modeled the association between PSQ-SRBD and total PCSS score. To assess inter-rater reliability, a subset of subjects had a second PCSS screen by a second dental provider.

Results: The sample included 97 children (94%-Non-Hispanic-White, 4% Hispanic, 2% other; 49%-female), with a mean age of 8.6 ± 2.2 . PSQ-SRBD scores were elevated in 20 (20.6%) participants. Three children were reported to overweight (on item specific question of PSQ-SRBD scale). Children with elevated PSQ-SRBD (>0.33) had lower NSES compared to children with PSQ-SRBD scores < 0.33 . PSQ-SRBD was associated with total PCSS score (OR=1.17 CI[1.01-1.36], $p=0.033$) and individual features including, narrow vaulted palate (OR=3.22, CI[0.94-10.93], $p=0.03$), forward head posture (OR=3.13, CI[1.11, 9.30], $p=0.03$), tongue thrust (OR=7.04, CI[1.20, 47.67], $p=0.03$), tongue tie (OR=7.58, CI[1.88, 33.58], $p=0.005$) and heart-shaped tongue (OR=11.21, CI[1.81, 98.11], $p=0.01$) after adjustment with age, sex, race and ethnicity. The correlation between total PCSS score and PSQ-SRBD was low ($R=0.39$, $p < 0.01$), however in subjects with at least one positive craniofacial feature, the correlation between significant PCSS features and PSQ-SRBD was moderate ($R=0.54$, $p < 0.01$). There was high inter-rater reliability ($\kappa=0.75$) in a subset of 53 subjects with second PCSS screens.

Conclusion: Multiple craniofacial features assessed during routine dental visits were associated with increased risk for pediatric SDB. This study points to the utility of a craniofacial scale to assess SDB risk in children. This pilot study will be expanded to include a more diverse patient population.

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0796

SAFETY AND EFFICACY OF THE COMBINATION OF ATOMOXETINE AND OXYBUTYNIN FOR OSA TREATMENT IN CHILDREN WITH DOWN SYNDROME

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Introduction: Children with Down syndrome (DS) are at very high risk for obstructive sleep apnea (OSA), with a prevalence of OSA of 50-79%. Current OSA treatments for children with DS have limited effectiveness, as positive airway pressure therapy is poorly tolerated and adenotonsillectomy is not curative in most children with DS. The combination of atomoxetine and oxybutynin (ato-oxy) is a promising OSA treatment in adults. Ato-oxy has been shown to improve upper airway hypotonia, a key feature of OSA in children with DS, thus it may be particularly effective for OSA in children with DS.

Methods: We performed a randomized, double-blind, crossover pilot trial examining the short-term efficacy of ato-oxy in 15 children aged 6 to 17 years with DS and OSA. Participants received 4 weeks of low dose (0.5 mg/kg atomoxetine and 5 mg oxybutynin) as well as 4 weeks of high dose (1.2 mg/kg atomoxetine and 5 mg oxybutynin) in random order. Participants underwent polysomnography as well as parent-reported health-related quality of life assessment using the OSA-18 at baseline and at the end of each dosing period. The primary study endpoint was reduction in obstructive apnea-hypopnea index (oAHI) from baseline. Paired t-tests were used to compare baseline to low and high dose ato-oxy.

Results: 15 participants qualified for randomization and 11 participants had complete data at all points. Baseline oAHI was 7.4 ± 3.7 (mean $\pm$ standard deviation), oAHI with low dose ato-oxy was 3.6 ± 3.3 ($p=0.001$ vs baseline) and oAHI with high dose ato-oxy was 3.9 ± 2.8 ($p=0.003$ vs baseline). There were no differences in sleep architecture or sleep efficiency between baseline and either dose of ato-oxy. OSA-18 total score was 51.5 ± 18.5 at baseline; improved to 44.6 ± 17.0 ($p=0.09$) at the end of 4-weeks of low dose ato-oxy; and improved to 45.5 ± 15.7 ($p=0.37$) at the end of high-dose ato-oxy therapy. The most common adverse effects were irritability and fatigue, and these were generally mild.

Conclusion: Ato-oxy is a promising treatment for OSA in children with DS.

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0797

CORRELATION BETWEEN OBSTRUCTIVE SLEEP APNEA AND ECHOCARDIOGRAPHY PARAMETERS IN INFANTS AND PRESCHOOL CHILDREN WITH DOWN SYNDROME

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Introduction: Down syndrome (DS) is one of the most common genetic disorders caused by the Trisomy of chromosome

21. Children with DS secondary to the unique airway anatomy and hypotonia, are at risk for obstructive sleep apnea (OSA). Untreated OSA in children can lead to serious complications because of chronic hypoxia leading to Pulmonary hypertension (PHTN) and Cor pulmonale. An overnight polysomnogram (PSG), the gold standard for diagnosing OSA in children, should be performed within 4 years per American Academy of Pediatrics recommendations. However, OSA in DS has been observed at a much younger age.

Methods: In this single-center retrospective study, data was collected by reviewing the medical records and PSG REDCap database from 2019-2021. Patients with ICD code 10 diagnosis of DS between 0 to 4 years of age who underwent PSG and echocardiography were included. Our primary aim was to assess the severity of OSA in preschool children and describe echocardiogram parameters in DS patients with OSA. We hypothesized that there will be differences in polysomnogram parameters of DS children with and without PHTN.

Results: 61 patients met the criteria for the study with the mean age being 11.3 months. 3 patients (5.4%) did not have OSA (apnea hypopnea index (AHI) < 1/hr), 11 patients (19.6%) had mild OSA (AHI 1-4.9/hr), 12 patients (21.4%) had moderate OSA (AHI 5-10/hr), 30 patients had severe OSA (AHI >10/hr). Five patients with missing AHI values were excluded for subsequent analyses. Echocardiogram parameters were compared using the described AHI cut offs to define severity of OSA. OSA was observed to be significantly higher in the group with elevated RV systolic pressure.

Conclusion: Although our study did not find any difference in PSG findings in young children with DS with and without PHTN, obstructive apnea index was significantly elevated in young children with elevated RV systolic pressure. OSA is a significant contributor to the development of PHTN in children with DS. Children with DS are at higher risk for PHTN due to their unique pulmonary vasculature. As PHTN is a significant comorbidity of DS, it is important to perform PSGs early during childhood to detect and treat OSA.

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0798

FREQUENCY OF SLEEP DISORDERED BREATHING AND COMORBIDITIES AMONG PRE-SCHOOL AGED CHILDREN WITH DOWN SYNDROME

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Introduction: Children with Down Syndrome (DS) are at high risk of sleep disordered breathing (SDB). The American Academy of Pediatrics recommends a polysomnogram (PSG) in children with DS prior to the age of 4. Data describing PSG parameters in this age group is limited. The purpose of this study is to examine the frequency of SDB, gas exchange abnormalities and comorbidities in this patient population.

Methods: This is a retrospective chart review of children ages 2-4 years with DS who underwent first PSG at Seattle Children's Hospital from 2015-2021. Data collected included demographics, comorbidities and PSG parameters: obstructive apnea hypopnea index (oAHI), central apnea index (CAI), time spent with

CO₂ levels > 50 mmHg, percentage of time spent with saturations < 88% and saturation nadir. Data is presented by descriptive statistics and comparison by unpaired t test.

Results: A total of 154 children underwent PSG during the study period and 75 met the inclusion criteria. Mean age was 3.03 years (SD 0.805), 56% were male and 54.7% were caucasian. Comorbidities included (n, %): cardiac (43, 57.3%), dysphagia or aspiration (24, 32.0%), prematurity (17, 22.7%), pulmonary (16, 21.3%), immune dysfunction (2, 2.7%) and hypothyroidism (23, 30.7%). PSG parameter data collected included (mean, SD): obstructive AHI (7.9, 9.4) and central AHI (2.4, 2.4). 94.7% met criteria for pediatric OSA, 9.5% met criteria for central apnea, and 9.5% met criteria for hypoventilation. Only 1 child met criteria for hypoxemia. 60% had surgical intervention with 89% of these being adenotonsillectomy. There was no statistically significant difference in the frequency of OSA at different ages and no significant difference in OSA or CSA in children with or without hypothyroidism or dysphagia ($p>0.05$).

Conclusion: Children with DS ages 2-4 years have high frequency of OSA. The most commonly encountered comorbidities were cardiac and dysphagia. Among those with OSA, more than half underwent surgical intervention, highlighting the importance of early diagnosis. Our previously published work showed that in infants with DS, dysphagia is correlated with severity of OSA. However, this was not shown in this abstract suggesting a potential larger contribution of other factors, such as adenotonsillar hypertrophy.

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0799

IMPACT OF HIGHLY EFFECTIVE MODULATOR THERAPY ON OBSTRUCTIVE SLEEP APNEA IN PEOPLE WITH CYSTIC FIBROSIS

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Introduction: Obstructive sleep apnea (OSA) is frequently seen in people with cystic fibrosis (PwCF). The presence of upper airway pathology including adenotonsillar hypertrophy and chronic sinusitis is a known risk factor for OSA in PwCF. The widespread use of highly effective modulator therapy (HEMT) such as elexacaftor/tezacaftor/ivacaftor has led to improvements in nutritional status, lung function, and sinus disease among PwCF. However, the impact of HEMT on OSA is still unknown.

Methods: We conducted a single center retrospective review of polysomnographic data in PwCF between 1/1/2009-10/31/2022.

Results: Fifty-three children with CF had undergone diagnostic polysomnography during the study period. Twenty-eight (53%) patients had OSA. Frequency of OSA did not differ by race or mutation type ($p>0.5$). Eighteen (34%) patients were on HEMT at the time of polysomnography. Mean ages of PwCF in the post-HEMT vs pre-HEMT were 11.6 ± 5.4 (sd) vs 6.4 ± 3.5 years respectively, $p=0.001$. Mean body mass index percentile was 70.8 ± 27.4 vs 55.8 ± 31.2 respectively, $p=0.09$. Mean forced expiratory volume in 1 second as a percent predicted was 97.1 ± 22.5 vs 87.0 ± 20.9 respectively, $p=0.2$. Frequency of OSA was 67% in the post-HEMT group and 46% in the pre-HEMT group ($p=0.1$). Snoring was present in 91% of PwCF in the pre-HEMT group and 78% of those in the post-HEMT group ($p=0.2$). Frequency of mouth breathing was 77% and 56% in the pre-HEMT and

post-HEMT groups respectively ($p=0.1$). Large adenoids were present in 37% of PwCF in the pre-HEMT group as compared to 11% of those in the post-HEMT group ($p=0.046$). Frequency of large tonsils in the pre-HEMT and post-HEMT groups was 43% vs. 28% ($p=0.3$). There were no differences in frequency of chronic sinusitis between the groups ($p=0.7$).

Conclusion: Frequency of OSA among PwCF continues to be high even in the post-HEMT era. PwCF on HEMT showed a trend towards more frequent OSA despite having less upper airway pathology. The better nutritional status afforded by HEMT could be contributing to the high frequency of OSA in this population. Larger studies are needed to formally test this hypothesis.

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0800

PEDIATRIC PSG FLAGGING ETIOLOGIES AND IMPACT ON CLINICAL TIMELINE

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Introduction: There is a paucity of literature regarding “flagged PSGs”, a term used to triage emergent PSGs for expedited scoring and reporting. Given the morbidity and multi organ-system dysfunction of untreated OSAS in children, it is extremely important to identify and treat expediently. The aim of this study was to review flagged PSGs at a tertiary level pediatric sleep center, including management and intervention timelines.

Methods: This is an IRB-approved retrospective chart review of flagged PSGs (N=266) over a three-year period (2019-2022) at a pediatric sleep center. PSGs were flagged based on laboratory protocols and provider discretion. Demographic, clinical, and PSG data were obtained from EMR.

Results: Patients with flagged studies were white (49.2%), non-Hispanic (87.2%), males (66.9%) with (mean $\pm$ SD) age (6.9 ± 6.0) years and BMI of (23.3 ± 11.6) kg/m², respectively. Reasons for flagging studies were repetitive brief oxygen desaturations < 80% (46.6%), sustained desaturations < 85% (32.3%), sustained EtCO₂ >60mmHg (5.6%), or other concerning events (15.5%). Most common comorbidity was pulmonary (41.4%), followed by genetic (30.5%), cardiac (23.3%), and neuromuscular (11.7%). 23.3% children were obese. 30.1% had prior airway surgeries; most commonly being adenotonsillectomy (70.0%). Mean Apnea-hypopnea index was 47.2 ± 36.1 events/hr. 35% children had hypoxemia and 36.8 % had hypoventilation. Time duration from flagging study to finalized report, surgical, or medical intervention was 4.3 ± 6.0 , 78.2 ± 105 and 26.6 ± 93.0 days, respectively. Medical (40.6%) and surgical (37.9%) intervention were similar in frequency; however, children < 8 were more likely to undergo surgery ($p<0.001$). Most frequent surgical intervention was adenotonsillectomy (82.1%). Patients with AHI>30 had less time between PSG and surgical intervention (65.3 ± 96.7 days vs 112 ± 119 days, $p=0.04$).

Conclusion: Most frequent reason for flagging PSG was repetitive brief desaturations. Time to surgical intervention was longer than medical intervention; however, they occurred in similar frequency. Pandemic staffing shortages and PAP machine recalls impacted both interventions. Patients with higher disease severity experienced quicker scoring, report finalization, and surgical intervention. Future directions include establishing protocols

between sleep laboratory and surgical teams, assess the impact of this and further streamline care.

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0801

PREDICTIVE VALUE OF HEART RATE VARIABILITY ON BP OUTCOMES IN OSA STATUS – A 10YR LONGITUDINAL STUDY

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Introduction: The apnoea/hypopnoea index (AHI) is commonly used as the indicator of OSA severity, but it cannot fully describe the illness severity, comorbidities, or treatment response. Heart rate variability (HRV) is a non-invasive way of detecting cardiac autonomic nervous system activity variations. It adds a new dimension to help understand the interplay between cardiac and nervous systems involvement in OSA. Aims: To explore the associations of HRV with OSA status in subjects from a longitudinal study where measurements were performed at 4-yr and 10-yr follow-up visits.

Methods: The cohort was established in 2003 to examine the prevalence of OSA in primary school children. During the 4-yr follow-up, HRV data in the time domain and frequency domain for 243 subjects when they were 10-17 years old were collected. Participants were invited to return for the 10-yr follow-up visit to undergo anthropometric measurements, overnight sleep study, and 24-hour ambulatory blood pressure (ABP) monitoring.

Results: Two hundred forty-three participants returned for the 10-yr follow-up. Participants who completed the HRV measurements at the 4-yr follow-up were included in this preliminary analysis. There were 122 participants (48.4% with OSA). Participants with OSA (AHI ≥ 5 event/h) at the 10-yr follow-up had a higher high frequency (HF) norm, a kind of HRV parameter, at the 4-yr follow-up than those without OSA (40.5 ± 22.1 n.u.) vs (33.7 ± 15.2 n.u.) ($P = 0.030$).

Conclusion: HRV parameters combined with OAH1 at 4yr likely partially explain SBP, and it can better predict SBP at 10yr than independent OAH1. HRV is prone to have an interaction effect, instead of a mediation effect, to help us predict SBP.

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0802

QUANTIFYING SCREENING EFFICACY AND REFERRAL PATTERNS IN WELL CHILD VISITS

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Introduction: Sleep-disordered breathing (SDB) can have profound impacts on pediatric physical, psychological and behavioral health. However, proactive history taking is needed to identify the signs of SDB, such as snoring. The American Academy of Pediatrics (AAP) therefore recommends that primary care providers actively screen for snoring at routine health maintenance visits. This study aims to assess the use of a snoring screening tool in our institution's Electronic Medical Record (EMR) well child visit templates and subsequent rate of screening for sleep disordered breathing during routine pediatric visits.

Methods: We queried our institution's electronic medical record for all patients ages 0-17 years who were presenting for their Well

Child Visit (WCV) from January 1, 2019 through September 30, 2022. The query yielded a convenience sample of 428,632 children. The question "does your child snore" was embedded into the WCV template for all primary care providers.

Results: Before the pandemic only 12.3% of WCVs (52,695 patients) had a completed screening question. The snoring prevalence was 6.4% (4,034 patients) with 15% (594 patients) of those who screened positive for snoring receiving a referral to ENT or sleep medicine (65% to ENT). During the COVID pandemic (2020-2021) the screening rate was 13.4%. The snoring prevalence was 5.2% with 19% being referred to ENT or sleep medicine. There was also an increase in screening during the COVID pandemic, but screening usage reverted to pre-COVID levels when pandemic restrictions eased in 2022.

Conclusion: The introduction of a snoring screening tool in generic WCV note templates did not significantly improve the rate of screening for sleep disordered breathing at routine pediatric visits. However, this embedded tool was used more often during the SARS-CoV2 pandemic, when many visits were performed using telemedicine. Our data collection also highlighted a high prevalence of snoring within our institution and a referral pattern that largely routes these children directly to Otolaryngology versus Pediatric Sleep Medicine. This makes it imperative to continue brainstorming ways to support primary providers' abilities to screen for SDB and empower them with management options.

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0803

SLEEP PATTERNS IN PATIENTS WITH CONGENITAL CENTRAL HYPOVENTILATION SYNDROME AND THEIR PARENTS

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Introduction: Congenital central hypoventilation syndrome (CCHS) is a rare genetic disease affecting control of breathing necessitating lifelong assisted ventilation (AV) via noninvasive positive pressure ventilation (NPPV), diaphragm pacing (DP), or positive pressure ventilation via tracheostomy (PPV-T). Owing to abnormal ventilatory responses, patients require monitoring during sleep by a caregiver. The aims of this study were to assess sleep patterns in the patient-parent dyads using actigraphy and sleep diary.

Methods: Patients with CCHS and their parents completed the Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD), Epworth Sleepiness Scale (ESS), sleep diaries, and used wrist actigraphy for 7 days. The analyzed data included AV modality, ESS, ESS-CHAD scores, and actigraphy outcomes—sleep latency (SL), sleep efficiency (SE), total sleep time (TST), wake after sleep onset (WASO), and wake frequency.

Results: The median (IQR) ages of the 11 patient-parent dyads who completed the study were 11(8-13.5) and 41(39-47.5) years, respectively. AV modalities were NPPV (n=3), DP (n=2), and PPV-T (n=6). The median (IQR) ESS-CHAD and ESS scores for the patient and parents were 8(2-9) and 6(3.5-7), respectively indicating higher normal daytime sleepiness. In patients with CCHS, actigraphy showed median (IQR) SL of 14.6(10.1-19.6) minutes, decreased SE of 78.5% (72.5%-84%), decreased TST

of 7.2(6.6-8.1) hours, elevated WASO of 1.7(1.1-2.3) hours, and frequent awakenings of 22.2(18.4-23.6) per night. In the parents, actigraphy showed median (IQR) SL of 7(3.6-10.9) minutes, normal SE of 81.6% (80%-86%), decreased TST of 6.7(6-6.8) hours, elevated WASO 1.1(1-1.3) hours, and frequent awakenings of 19.3(15.4-22.4) per night. Two separate patients and parents slept < 6 hours per day. Among 2 patients with nighttime home nursing, the parents had SE >85%, TST ≥7.3 hours, and reported better sleep quality.

Conclusion: Patients with CCHS and their parents are at risk for sleep disturbances. Specifically, patients with CCHS had decreased median TST and SE, and parents had decreased median TST. Both patients and parents had frequent night wakings indicating sleep disruptions. Nighttime home nursing may improve parental sleep. Apart from vigilant management of AV in patients with CCHS, clinicians should also evaluate sleep quality in patients with CCHS and their parents.

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0804

SLEEP-DISORDERED BREATHING IN MYELOMENINGOCELE AND CHIARI II MALFORMATION: OUR EXPERIENCE AT A TERTIARY CARE CENTER

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Introduction: Children with myelomeningocele (MMC) and Chiari Malformation type II (CMII) have some degree of sleep-disordered breathing (SDB), which may include central apnea, obstructive apnea, and hypoventilation. Untreated SDB may lead to growth failure, neurocognitive and behavioral abnormalities, cor pulmonale, and death. There is no standardized diagnostic and management protocol to be followed if SDB is suspected in a patient with CMII and MMC.

Methods: Variability in physician practice patterns was assessed for patients with CMII and MMC suspected of having SDB at a tertiary care center from January 2008 to December 2018.

Results: 180 patients with CM2 and MMC were identified. Pulmonology/Sleep providers were consulted on 63 of them. A sleep study was ordered for 73% of these patients, with snoring being the most common indication. Most patients had obstructive sleep apnea, with mean obstructive AHI of 6 events/h. Recommendations after sleep study included supplemental oxygen (20%), non-invasive positive airway pressure initiation (9%), subspecialty referral in 35% (otolaryngology and neurosurgery), and tracheostomy with mechanical ventilation in 10% of the patients.

Conclusion: In a large tertiary care center, there was significant variability in clinical practice patterns for children with CM2 and MMC who have SDB. Clinicians caring for these patients should consider PSG to enhance early diagnosis and management of SDB. A standardized diagnostic and management protocol could complement physician judgment to care for this complex patient population.

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0805

TARGETING SLEEP DISORDERED BREATHING SCREENING DURING THE SARS-COV2 PANDEMIC: PARENTS OR PROVIDERS?

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Introduction: Sleep-disordered breathing (SDB) can significantly impact a child's physical and psychological well-being. Primary care teams are strongly positioned to first note the signs of SDB and the American Academy of Pediatrics recommends routine screening for snoring at all well-child visits (WCV). However, the literature demonstrates low rates of application of this recommendation. This is likely multifactorial as noted by previous studies on the subject. This study aimed to assess if providing an electronic questionnaire to families ahead of the WCV would increase the snoring screening rate.

Methods: This quality improvement (QI) program consisted of a convenience sample (control n=504, program n=222) of 726 children, age 2-17 years presenting for their new or well-child-visit (WCV) over six weeks during the SARS-CoV2 pandemic. The Pediatric Sleep Questionnaire (PSQ) was delivered to parents via the electronic patient portal (EPP) 1-2 weeks before their child's appointment. The questionnaire was then auto imported into the physician's note at the time of the appointment.

Results: The QI program showed a lower overall SDB screening rate (16.7%) than the pre-program control (21%), however, 3 of 4 (75%) of the participating physicians saw an increase in SDB screening during the program. Statistical significance was seen in two physicians ($X^2(1, N=262) = 27.150, p=.000, \Phi = .332$ and Fisher exact test $p=.000, 2$ -tailed, $\Phi = .366$).

Conclusion: The screening rate for snoring significantly increased among physicians when electronic questionnaires were provided to families prior to scheduled WCV. This is an early but promising pattern. The electronic patient portal can serve as an important asynchronous tool for providers to gather valuable information about the sleep quality of children in their practice, aligning with AAP goals and better supporting families.

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0806

TREATMENT OF SLEEP DISORDERED BREATHING IMPROVES QUALITY OF LIFE IN CHILDREN WITH DOWN SYNDROME

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Introduction: Children with Down syndrome (DS) are at increased risk of obstructive sleep disordered breathing (SDB), which is associated with sleep disruption affecting daytime functioning. We examined the effects of treatment of SDB on sleep and daytime functioning in children with DS.

Methods: Children with DS and SDB (n=34) completed a baseline and follow-up study which included 7 days of actigraphy in conjunction with a parental sleep diary. Parents also completed a number of questionnaires assessing sleep, behaviour, daytime

functioning and quality of life (QOL). All children had overnight polysomnography (PSG) at baseline and 24 had PSG at follow-up.

Results: 15 children (44%) were treated. At baseline the treated group had more severe SDB at baseline compared to the untreated group: obstructive apnoea hypopnoea index (OAHI) 29.3 ± 38.2 events/h vs 3.3 ± 5.2 events/h ($p < 0.01$). Actigraphy showed no significant differences in total sleep time or sleep efficiency from baseline to follow up in either the treated or untreated group. Wake after sleep onset increased at follow-up in the untreated group ($p < 0.01$). The sleep disturbance ($p < 0.01$) and total problems ($p < 0.05$) scales on the OSA-18 and the SDB subscale on the Pediatric Sleep Problem Survey Instrument ($p < 0.01$) improved in the treated children. No changes were seen in any of the measures in the untreated children.

Conclusion: Treatment of SDB improves QOL, despite treatment having no demonstrable impacts on actigraphic sleep measures. In contrast despite having less severe SDB children who were untreated had no improvements in QOL and increased sleep disruption.

Support (if any): Jerome Lejeune Foundation

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0807

THE ODDS RATIO PRODUCT AS A METRIC OF OBSTRUCTIVE SLEEP APNEA SEVERITY IN ADOLESCENTS

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Introduction: Although the apnea-hypopnea index (AHI) remains the gold-standard metric of the severity of obstructive sleep apnea (OSA), it is often criticized for its limitations. The odds ratio product (ORP), a continuous standardized measure of sleep depth that ranges from 0 (deep sleep) to 2.5 (full wakefulness), has been proposed as a potential EEG-based alternative to assess the severity of OSA, including its association with cardiovascular outcomes such as elevated blood pressure (eBP).

Methods: We extracted ORP during rapid eye movement (REM) and non-REM sleep stages from the sleep EEG of 421 adolescents (median 16y) from the Penn State Child Cohort. Higher ORP indicates lower sleep depth. Systolic and diastolic BP levels were measured in the seated position and eBP was identified using American Heart Association guideline-recommended pediatric criteria. OSA was defined as an AHI of 2 or greater events per hour of sleep. Logistic regression models examined the joint effect of AHI and ORP on eBP, while adjusting for sex, age, race/ethnicity and body mass index, and stratified by the presence of OSA.

Results: We found a significant interaction between AHI and ORP on eBP (p -interaction=0.016). Among adolescents with OSA, each additional 0.5-point increase in ORP was associated with 6.3-fold odds (95%CI=1.9-20.6, $p=0.003$) of eBP. Specifically, each additional 0.5-point increase in ORP was associated with 6.4 mmHg (SE=3.0, $p=0.036$) higher systolic BP among adolescents with OSA. These associations were not significant among adolescents without OSA (eBP: OR=0.8,

95%CI=0.4-1.8, $p=0.602$ for each additional 0.5 increase in ORP).

Conclusion: Our data support ORP as a prognostic sleep-EEG metric of OSA in youth. Future clinical trials should examine the added value of ORP in OSA endophenotyping, its response to treatment and role in improving cardiovascular outcomes.

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0808

COMPARISON OF MAXILLARY TRANSVERSE DIMENSION WITH PEDIATRIC OBSTRUCTIVE SLEEP APNEA PRESENCE AND SEVERITY

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Introduction: Obstructive Sleep Apnea (OSA) in children and adolescents is commonly discussed amongst dental specialists. Physical attributes such as a high and narrow palate, dolichofacial appearance, and retrognathic mandible are reported to increase pediatric risk for OSA. Previous research states rapid maxillary expansion decreases AHI in children with OSA and may be an effective treatment option. Current literature does not report a consistent method of measuring a maxillary transverse deficiency nor does it report a numerical maxillary threshold deficiency that requires expansion in pediatric patients with OSA. Our aims are to compare two different orthodontic diagnostic methods for measuring the maxillary transverse dimension and to assess whether patients diagnosed with mild, moderate, or severe OSA have a numerical threshold for maxillary deficiency.

Methods: Participants were ages 7-17 years old (average 11.7 years) with no history of orthodontic treatment, craniofacial syndromes, craniosynostosis forms, or nasal abnormalities. Those with and without adenoids and tonsils were included. Participants presented to the Mayo Clinic Sleep Center for their polysomnogram. Their dentition was scanned, and a digital model was rendered. The maxillary transverse dimension was measured via two different methods: McNamara's Analysis and Andrew's Six Elements of Orofacial Harmony.

Results: There were 65 participants: 31 diagnosed with OSA (13 Mild, 4 Moderate, 5 Severe, and 9 Other) and 34 without (controls). Patients in the Other category were diagnosed based on clinical findings. No statistical difference was found between the maxillary transverse measurements of patients with versus without OSA or between the OSA categories. Patients with OSA were more likely to have permanent teeth (61.3% vs 32.4%, $p=0.019$), tonsils removed (54.8% vs 26.5%, $p=0.020$), and to have snored during the PSG (83.9% vs 55.9%, $p=0.048$).

Conclusion: Conclusions based on this pilot study should be interpreted carefully due to limited sample sizes. No statistically significant differences of the maxillary transverse dimension were found between those with and without OSA using either diagnostic method. No numerical maxillary deficiency threshold was found. Maxillary expansion should not be recommended based on OSA diagnosis alone. Referral to a dental specialist is recommended based on dental needs.

Support (if any): Support was provided by Mayo Clinic CTSA grant UL1TR002377.

Abstract citation ID: zsad077.0809

0809**DEVELOPMENT AND VALIDATION OF A QUESTIONNAIRE TO ASSESS TODDLER SLEEP**Gita Gupta¹, Louise O'Brien¹, Louis Dang¹, Shewar Ibadat¹, Katherine Neff¹, Julie Sturza¹, Renée Shellhaas²¹ University of Michigan, ² Washington University in St Louis

Introduction: Few sleep questionnaires focus on toddlers, whose sleep is unique from both infants and older children. Fewer include both medical and behavioral items, or have been externally validated against polysomnograms (PSGs).

Methods: Caregivers of children 12 to 36 months old were recruited through social media, flyers in common hospital spaces, general pediatrics clinics, a pediatric neurology clinic, and at the sleep lab. A questionnaire using a 5-point Likert scale was developed. Questionnaire items pertained to behavioral issues, restless legs syndrome, sleep-disordered breathing, dysautonomia, feeding, attitudes toward sleep, and comorbidities. Factor analysis was used to determine which items represent distinct dimensions of toddler sleep. A diagnosis of sleep apnea was not included in the generation of the factors. Cronbach's alpha was calculated to evaluate internal consistency within the derived factors. Sleep apnea was defined as the presence of either obstructive or central sleep apnea diagnosed by PSG. We used receiver operating characteristic (ROC) curves to determine which factors most closely estimate sleep apnea. Concordance of factors with the presence of sleep apnea was determined by measuring the area under the ROC curve (AUC).

Results: Responses from 720 caregivers of toddlers were used to generate the factors. External validation was performed using the PSG data of 35 children. One distinct factor emerged which had good concordance with a diagnosis of sleep apnea (AUC≥0.70). The factor was comprised of the following items: "My child has noisy breathing during sleep", "My child snorts and gasps during sleep", "My child snores", "My child's breathing is heavy during sleep", "My child breathes through their mouth while sleeping", "My child breathes through their mouth during the day", "My child 'belly breathes' during sleep"; Cronbach's alpha=0.83; AUC=0.70). Factors associated with daytime behavior, behavioral insomnia of childhood, and excessive daytime sleepiness were not associated with sleep apnea.

Conclusion: Obstructive features are most associated with sleep apnea, whereas daytime and bedtime behavioral characteristics, and excessive daytime sleepiness are not, unlike in studies of older children. This may reflect the natural history of sleep apnea in children. Further study with a larger sample size is required to confirm this finding.

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Abstract citation ID: zsad077.0810

0810**EFFECT OF SUPRAGLOTTOPLASTY ON RESPIRATORY PARAMETERS IN INFANTS AND CHILDREN WITH LARYNGOMALACIA AND OXYGEN DEPENDENCE**Johanna Wickemeyer¹, Aisaku Nakamura², Md Monir Hossain², Narong Simakajornboon³¹ Cincinnati Children's, ² Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, ³ Division of Pulmonary and Sleep Medicine, Cincinnati Children's Hospital Medical Center

Introduction: Supraglottoplasty (SGP) is the surgical treatment of choice for laryngomalacia and obstructive sleep apnea (OSA).

Several recent studies have shown that oxygen can act to stabilize ventilatory control in infants with OSA and high loop gain. However, there is very limited information on the effect of SGP on OSA in infants with laryngomalacia and evidence of high loop gain.

Methods: A retrospective chart review was performed in infants with laryngomalacia and OSA at Cincinnati Children's Hospital Medical Center from January 2008 to June 2022. Only patients treated with oxygen prior to SGP were included in the analysis. The pre-surgical polysomnograms (PSGs) were classified by responsiveness to oxygen into 2 groups; oxygen responders ([R]; >50% decrease in apnea-hypopnea index (AHI) with oxygen, indirect evidence of high loop gain) and non-responders ([NR]; < 50% decrease in AHI). Data were reported as mean±SD. The comparison of AHI and obstructive AHI (OAH) between pre-surgical and post-surgical PSGs were performed in each group using paired t-test or Wilcoxon signed rank test. The differences of percentage decreases in AHI and OAH after surgery between R and NR were calculated using Wilcoxon Rank Sum test.

Results: Forty-nine infants (with 52 SGPs) met the study enrollment criteria, with 33 (67.3%) male and 16 (32.7%) female patients. There were no statistically significant differences in age or sex between oxygen responders and non-responders. AHI after SGP in both oxygen responders (50.1±59.2/hr [pre] vs 17.6±21.1/hr [post]; P< 0.0001) and oxygen non-responders (25.2±13.3/hr [pre] vs 12.4±9.4/hr [post] vs; P=0.0006) decreased significantly. Similarly, there were significant decreases in OAH after SGP in both groups. Additionally, there were no significant differences in the percentage decreases of AHI (57.3±26.1% [R] vs 41.4±48.8% [NR]; P=0.6410) and OAH (64.0±21.9% [R] vs 50.3±41.4% [NR]; P=0.5260) between the 2 groups.

Conclusion: Both oxygen responders and non-responders had significant decreases in AHI and OAH after surgery with similar magnitude of improvement. Supraglottoplasty is an effective treatment in infants with laryngomalacia and OSA, even in those with evidence of high loop gain. We speculate that non-anatomic traits such as high loop gain would only manifest in the context of significant respiratory disturbances from anatomic traits.

Support (if any):

Abstract citation ID: zsad077.0811

0811**IMPACT OF TONSILLECTOMY AND ADENOIDECTOMY ON DELTA POWER IN CHILDREN WITH OBSTRUCTIVE SLEEP APNEA**Sowjanya Naha¹, Bhavana Kranthi¹, David Cohen¹, Zarah Ner¹, Pradeep Sahota², Mahesh Thakkar²¹ University of Missouri-Columbia, ² MU HealthCare Sleep Disorders Center

Introduction: Delta power is a known indicator of sleep drive and sleep pressure. Non-REM sleep delta power is increased in adults with sleep-disordered breathing, and lowered by treatment with continuous positive airway pressure (CPAP). Our purpose was to investigate the effect of tonsillectomy and adenoidectomy on delta power in children with sleep apnea. Here we report results from the pilot study phase of this project.

Methods: A retrospective study was performed using consecutive children between the age of 5 and 15 years presenting to our Sleep Disorders Clinic between October 2019 and October 2022 who underwent tonsillectomy and adenoidectomy for

obstructive sleep apnea and for whom polysomnographic data was available from before and after the procedure. Spectral power density analysis was performed using polysomnography data to determine delta power.

Results: A total of 41 children were screened of whom appropriate polysomnography studies were available for 10 children. The mean delta power prior to surgery was 2687.8 ± 1081 , while the mean delta power after surgery was 1737.9 ± 522.9 . Paired t-test was performed and showed a significant and large (~65%) reduction in delta power (Cohen's D 0.91; $p=0.018$).

Conclusion: Results of the pilot study showed a large and statistically significant reduction in delta power after tonsillectomy and adenoidectomy. This finding is consistent with the expected improvement in sleep pressure with correction of sleep apnea. Delta power represents a potent new metric to measure the biological efficacy and impact of surgery in children with sleep apnea.

Support (if any): None

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0812

INCONSISTENT IMPROVEMENTS OF NEUROCOGNITIVE FUNCTION AFTER ADENOTONSILLECTOMY: A PEDIATRIC SLEEP-DISORDERED BREATHING COHORT STUDY

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Introduction: Adenotonsillectomy (AT) is the most common surgical treatment for pediatric obstructive-sleep-apnea (OSA) with fair effectiveness. There are still controversies about the improvement of neurocognitive function after AT. This study investigates the changes of neurocognitive function after AT in preschool and school age children with OSA, including intelligence and attention, and explore the inconsistent improvements by comparing different evaluation tools.

Methods: 130 children with pediatric OSA were recruited, including 30 preschool and 100 school-age children. 125 participants underwent clinical evaluation, including polysomnography (PSG), before and 1-year after AT. Preschool children received the Wechsler-Preschool-and-Primary-Scale-of-Intelligence (the revised and IV edition, WPPSI-R and WPPSI-IV) and the Conners'-Kiddie-Continuous-Performance-Test (K-CPT) while school-age children received the Wechsler-Intelligence-Scale-for-Children (the 3rd and 4th edition, WISC-III and WISC-IV), and the Conners'-continuous-performance-test-II (CPT-II), before and 1-year after AT. Questionnaires including the Obstructive-Sleep-Apnea-Questionnaire-18 (OSA-18) and Child-Behavior-Checklist (CBCL) were also used. The t-test and chi-square test analysis was used to compare data between preschool and school-age children, including PSG, CPT variables, intelligence variables, OSA-18 and CBCL before and after AT, as well as group differences in changes. Correlation analysis of CPT variables were performed by using the Pearson-Correlation to investigate factors related to treatment response.

Results: No significant group difference was found except age ($p=0.000$) and less male gender in preschool children ($p=0.049$). 21.7% of preschool children had language delay, and more than 80% of all children had allergic rhinitis or high narrow palate. After AT, both groups had significant improvement in PSG and OSA-18. No significant change was found by WPPSI-IV in the preschool children and WISC-IV in the school-age children, but significant improvements were found in preschool children and school-age children by

WPPSI-R and WISC-III. There were also significant improvements of CPT-II in school-age children, and the Hit-reaction-time-standard-deviation positively correlates with the improvement in PSG.

Conclusion: Besides the improvement of sleep apnea and subjective improvements of emotion and behavior, AT can be beneficial in the neurocognitive function of preschool and school-age children with OSA, including intelligence and attention. Some tools may not be sensitive enough to detect the improvement in neurocognitive function, and selection of proper evaluation tools can be important in study design.

Support (if any):

Abstract citation ID: zsad077.0813

0813

INCREASING ACCESSIBILITY OF ASSESSMENT OF OBSTRUCTIVE SLEEP APNEA SYNDROME IN YOUTH WITH DOWN SYNDROME

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Introduction: Because of the high risk for obstructive sleep apnea syndrome (OSAS) in youth with Down syndrome (DS), in-lab polysomnogram (PSG) is recommended by age 4-years and if symptom screening warrants. Unfortunately, screening for "traditional" OSAS symptoms has been considered unreliable DS. Further, while in-lab polysomnography (PSG) is the gold standard in assessment of OSAS, undergoing in-lab PSG is time and cost intensive and often stressful for youth with DS and their families. This study examined the relationship of sleep disturbance questionnaires with in-lab PSG and home sleep apnea testing (HSAT) in youth with DS.

Methods: As part of a larger study comparing PSG to HSAT in individuals with DS aged 6-25y, caregivers completed the parent-proxy Pediatric Promis Sleep Disturbance Measure (PPSDM) and Modified Epworth Sleepiness Scale (ESS). The relationships of the PPSDM and ESS and sleep study variables (total sleep time, oxygen desaturation nadir (SpO2 nadir), wake after sleep onset (WASO), sleep efficiency, obstructive hypopnea index (OAH), and arousal index) were examined using Spearman correlation.

Results: Caregiver-completed questionnaires were available for 38 individuals with DS (18 males; mean age of 15.0 ± 4.7 , 84% White; 95% Non-Hispanic). PSG OAH median [IQR] was 12.9[5.5-22.8] events per hour, SpO2 nadir 86.5[81-89] %, PPSDM 25[20-33], ESS 2.5[1-8]. The PPSDM was negatively correlated with PSG SpO2 nadir ($r=-0.437$; $p=0.006$) but with no additional HSAT or PSG variables. ESS was positively correlated with the obstructive apnea hypopnea index (OAH) on both PSG ($r=0.340$, $p=0.03$) and HSAT ($r=0.372$; $p=0.02$) and negatively correlated with HSAT WASO ($r=-0.369$; $p=0.02$).

Conclusion: Given the limited availability of sleep specialists and labs equipped to complete PSG in individuals who may require increased attention, overnight pulse oximetry overnight coupled with ESS and caregiver completed sleep disturbance questionnaires may provide an initial, noninvasive, cost-effective method to screen for OSAS in individuals with DS. Considering that ESS correlated with OAH, this questionnaire could be used to decide repeat PSG in youth with DS.

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0814**OBSTRUCTIVE SLEEP APNEA IN ASTHMATIC CHILDREN: HIGHLY PREVALENT THOUGH NO IDENTIFIABLE RISK FACTORS.**Sonia Togeiro¹, Cristiane Santos², Sergio Tufik³, Anna Smith⁴, Gustavo Moreira⁵¹ Universidade Federal de São Paulo, ² Universidade Federal de São paulo - EPM, ³ Universidade Federal de São Paulo, ⁴ Sleep Institute - AFIP, ⁵ UNIFESP

Introduction: Obstructive sleep apnea (OSA) and Asthma often coexist. There is some evidence that adults with asthma are more prone to developing OSA than the general population, as well as OSA may impact asthma control. Different than adults, OSA prevalence is equal in boys and girls, while puberty has strong influence in asthma, especially in pubescent girls. The objectives of this study were to analyze the prevalence of OSA in boys and girls and the impact of asthma severity in OSA prevalence.

Methods: Asthmatic children attending a tertiary pediatric pulmonology clinic performed clinical evaluation, Pulmonary Function Test, and Home Sleep Apnea Test. OSA was defined as habitual snoring and one or more obstructive respiratory events (OREI) per hour of recording. Control and severity of Asthma were evaluated according to Global Initiative for Asthma and puberal stage using Tanner figures for boys and girls

Results: We studied 80 consecutive patients, 7 to 18 years-old, mean age 11.6 years (SD: 2.7), 51.3% female. According to BMI z-score, nutritional status was: 2 (2.5%) underweight, 63 eutrophic (79%), and 15 obese (18.5%). Puberty was present in 17 volunteers. Pulmonary Function Tests were obtained from 71 volunteers, 45% presented obstruction pattern. Home Sleep Apnea Tests were available from 76 volunteers, with mean OREI of 1.8 events/h. OSA occurred in 69 volunteers (91%), while 66% were mild, 21% moderate, and 4% severe. We did not find associations of obstructive sleep apnea with sex or asthma severity.

Conclusion: OSA was highly prevalent among these asthmatic children, but most were mild. Sex and asthma severity were not associated to OSA. Considering the interrelationship of both diseases, it is worth to keep in mind the possibility of OSA among children and teenagers with asthma.

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Abstract citation ID: zsad077.0815

0815**UTILIZATION OF TELEMEDICINE VISITS IN A PEDIATRIC SLEEP CENTER AND THE EFFECT ON PAP ADHERENCE RATES**April Scribner¹, Beverly Spray², Denise Willis¹, Kristi Pruss¹, Supriya Jambhekar³¹ Arkansas Children's Hospital, ² Arkansas Children's Research Institute, ³ University of Arkansas Medical Sciences

Introduction: Although positive airway pressure (PAP) is an effective treatment for OSA, adherence is often suboptimal. Consistent follow up is needed to address barriers to adherence; however, in-person clinic attendance in our center has been low and was further reduced during the COVID-19 pandemic. Suboptimal adherence may result in cessation of reimbursement by insurance, leaving OSA untreated. Untreated OSA in children

can lead to behavior and learning problems, impaired growth and cardiovascular complications. Due to the decrease in show rates, in-home telemedicine visits were offered in lieu of in-person visits.

Methods: A retrospective chart review was performed for children with OSA seen in the pediatric sleep clinic from March 2020 and October 2022. Subjects were excluded from analysis if they did not transition to telemedicine. Telemedicine visits were conducted in the same manner as in-person visits. PAP usage after telemedicine was compared to in-person visits. Adherence was reported as percent of total usage and percent of usage greater than four hours (U>4h) per night.

Results: Three hundred nineteen charts were reviewed of whom the majority were male (69.9%). The median age (interquartile range) at PAP initiation was 12 years (7-15). Seventy eight subjects were included in the analysis. Mean U>4h and total usage decreased when subjects transitioned from in-person to telemedicine visits ($4.18\% \pm 26.7$, $p=0.17$ ($3.08\% \pm 22.5$, $p=0.23$), respectively. These differences were not significant. 36 subjects (46%) had $< \pm 5\%$ change in total adherence, 23 (29%) had $> 5\%$ increase in total adherence, and 19 (24%) had $> 5\%$ decrease. When comparing change in U>4h, 29 (37%) subjects had $< \pm 5\%$ change in adherence, 22 (28%) had $> 5\%$ decrease, and 27 (35%) had $> 5\%$ increase in adherence.

Conclusion: There were no statistically significant differences in adherence rates between telemedicine and in-person visits. Adherence improved in some children on transition from in-person to telemedicine visits. Utilization of in-home telemedicine visits may be a useful alternative for some children treated with PAP. Further studies are needed to determine which specific patient populations may benefit most from in-home telemedicine visits.

Support (if any):

Abstract citation ID: zsad077.0816

0816**ACTIGRAPHY-MEASURED SLEEP TIMING AND RISK OF BREAST CANCER IN THE UK BIOBANK**

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Introduction: Shift work leading to circadian disruption is associated with increased breast cancer risk, but it remains unclear whether typical sleep timing variation in the general population that may cause less extreme disruption is also associated with increased risk. Prior studies relied on sleep timing assessed using self-report, but research using actigraphy is limited. Our goal was to characterize the association between sleep timing and breast cancer risk using actigraphy-based measures.

Methods: Our sample included 43,109 women without a history of breast cancer in the UK Biobank cohort who wore Axivity-AX3 accelerometers over 7 days. We estimated sleep midpoints, the median of sleep onset and waking. Social jetlag was estimated as the absolute difference in average weekend and weekday sleep midpoints. We used multivariable Cox models to estimate hazards ratios (HRs) and 95% confidence intervals (CI), adjusting for age, body mass index, participant characteristics, socioeconomic status, physical activity, menopause, parity, and oral contraceptive use. We conducted a sensitivity analysis excluding shift workers to control for potential strong confounding from shift work.

Results: Over 6.2 years of follow-up, there were 683 incident breast cancer cases. Earlier and later sleep midpoints were not associated with breast cancer (Early, < 4:00AM HR:1.08 [95%CI: 0.89-1.32]; Later, ≥5:00AM HR:1.24 [0.86-1.81]; vs. Reference 4:00-4:59 AM). Per-hour increases in social jetlag were suggestively associated with greater breast cancer risk (HR:1.09 [0.96-1.24]), but significantly higher risk was only noted at the highest levels of social jetlag comparing ≥2 hours to < 1 hour (HR:1.58 [1.13-2.20]). Results were unchanged when excluding shift workers.

Conclusion: Higher levels of social jetlag among UK women appeared to be associated with elevated breast cancer risk, possibly due to circadian disruption. While our results suggest that minimizing variation between weekday and weekend sleep timing may be related to lower breast cancer risk, replication of our findings in future studies using actigraphy-based measures and larger case numbers is needed.

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0817**ASSOCIATIONS BETWEEN SLEEP HEALTH AND INJURIES AMONG ADULTS IN THE US: FINDINGS FROM THE NATIONAL HEALTH INTERVIEW SURVEY**

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Introduction: In 2020, 55.4 million Americans sought medical attention due to nonfatal, preventable injuries. Injury-related death rate was 15.7% higher than in 2019. Poor sleep health is associated with increased risk of injuries (e.g., falls, sports, and motor vehicle-related injuries). This study examined the associations between sleep health and injuries among adults (≥18 years).

Methods: This study utilized the 2020 National Health Interview Survey (n=31,568). The primary outcome encompassed sustained bodily injuries in the past 3 months. Secondary outcomes were fall-related, sports-related, and motor vehicle (MV)-related injuries. Sleep health in the past month was measured via 1) sleep quantity: very short (≤ 4 hours), short (5-6 hours), healthy (7-8 hours), or long (≥9 hours); 2) sleep quality: trouble falling asleep and trouble staying asleep; 3) feeling well-rested upon waking-up; and 4) sleep medications. Response categories included never, some days, most days, or every day. Adjusted multivariable logistic regression was used to examine associations between injuries and these four domains of sleep health.

Results: Overall, 9.1% of respondents sustained an injury. Among injured adults, 47.4% had fall-related injuries, 29.1% had sport-related injuries, and 6% had a MV-related injury. Adults with very short, short, and long sleep were 37%, 15%, and 22% more likely to be injured than adults with healthy sleep ($p < 0.05$). Adults with trouble staying asleep were 36% more likely to be injured than adults who never had trouble staying asleep ($p < 0.01$). Adults who woke up never rested or rested on some days were 49% and 36% more likely to be injured ($p < 0.01$). Adults who took medications for sleep on some days or every day were 24% and 36% more likely to be injured ($p < 0.05$; $p < 0.001$). Adults who had trouble staying asleep some days were 22% more likely to have a fall-related injury ($p < 0.05$). Respondents with long sleep were 43% less likely to have sports-related injuries ($p < 0.05$). Those who had trouble staying asleep were 3.5 times more likely to have experienced a MV-related injury ($p < 0.01$).

Conclusion: Sleep health is strongly associated with injuries among adults. Further studies are needed to determine causality in the observed associations.

Support (if any):

Abstract citation ID: zsad077.0818

0818**COMORBID OBSTRUCTIVE SLEEP APNEA AND INSOMNIA IN TYPE 2 DIABETES: ASSOCIATION WITH DIABETES-RELATED DISTRESS AND GLYCEMIC CONTROL**Bomin Jeon¹, Eileen Chasens², Faith Luyster²¹ University of Iowa College of Nursing, ² University of Pittsburgh School of Nursing

Introduction: It is unclear how comorbid insomnia and sleep duration may influence diabetes-related distress and glycemic control in adults with obstructive sleep apnea (OSA) and type 2 diabetes (T2D). This analysis examined whether diabetes-related distress mediates the associations of OSA and insomnia severity with glycemic control in adults with T2D and OSA based on sleep duration.

Methods: This study was a secondary analysis of merged baseline assessment data from two clinical trials of adults (N=240) with self-reported T2D and OSA. OSA (apnea-hypopnea index ≥ 5) was determined by a home sleep study. Participants completed questionnaires to elicit insomnia severity, diabetes-related distress, sleep duration, daytime sleepiness, and global sleep quality. Sleep duration was classified as normal (>6 h) or short (≤ 6 h). Glycemic control was measured by HbA1c (%). Mediation analyses with bootstrapped samples were employed after controlling for sociodemographic covariates in participants with normal and short sleep durations.

Results: More participants (mean age 57.8 years; 49.6% female; 65% White; 56.3% post high school education, mean HbA1c 7.93%) had short sleep duration (n=128; 53.5%) than normal sleep duration (n=111, 46.5%). Participants with short sleep duration had significantly worse sleep quality, daytime sleepiness, insomnia, and HbA1c levels compared to those with normal sleep duration (all $p < .05$). In participants with normal sleep duration, insomnia severity was associated with diabetes-related distress ($b=0.942$, $p=0.008$); diabetes-related distress did not mediate the association between insomnia severity and HbA1c (indirect effect [IE]=0.013, 95% CI: -0.003, 0.036). In participants with short sleep duration, insomnia severity was significantly associated with diabetes-related distress ($b=1.470$, $p < 0.001$), and diabetes-related distress mediated the association between insomnia severity and HbA1c (IE=0.023, 95% CI: 0.001, 0.053). Regardless of sleep duration, OSA severity was not associated with diabetes-related distress or HbA1c.

Conclusion: Only among participants with short sleep duration, comorbid insomnia significantly contributes to greater diabetes-related distress, which leads to higher HbA1c levels. Short sleep duration in persons with insomnia could be a potential mechanism involved in the association between diabetes-related distress and glycemic control in adults with T2D and OSA.

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Abstract citation ID: zsad077.0819

0819**DOES SLEEP HEALTH MODIFY THE RELATIONSHIP BETWEEN HYPERTENSIVE DISORDERS OF PREGNANCY AND INCIDENT CARDIOVASCULAR DISEASE?**Chandra Jackson¹, Symielle Gaston¹, Judette Louis², Dale Sandler¹¹ National Institute of Environmental Health Sciences, ² University of South Florida

Introduction: With pregnancy considered a cardiovascular “stress test”, adverse pregnancy outcomes (APOs), such as gestational hypertension, have been associated with higher risk of poor cardiometabolic health later in life. Sleep has been identified as a contributor to cardiometabolic health; however, few studies have considered how sleep may affect APO-associated cardiovascular disease risk.

Methods: To investigate sleep health during middle-to-older adulthood as a potential modifier of longitudinal associations between hypertensive disorders of pregnancy (HDP) and CVD incidence, we used data collected from 32,313 parous women (mean $\pm$ SD age 55 $\pm$ 8.9 years) without prior CVD in the Sister Study (enrollment: 2003-2009; n=1,407 Hispanic/Latina, n=2,411 non-Hispanic (NH)-Black, n=27,683 NH-White, and n=812 another race/ethnicity). Report of physician-diagnosed CVD or death from CVD (i.e., heart failure, myocardial infarction, stroke) was collected over follow-up until October 2020. At enrollment, participants reported a history of HDP (i.e., gestational hypertension, preeclampsia, eclampsia) and current sleep health characteristics (i.e., short (< 7 hours) habitual sleep duration, frequent napping, insomnia symptoms; all yes vs. no). Adjusting for sociodemographic, health behavior, and clinical characteristics, Cox proportional hazards regressions estimated hazard ratios (HRs) and 95% confidence intervals (CIs) for CVD among participants with vs. without history of HDP. Wald tests assessed HDP*sleep characteristics interactions.

Results: Overall, 11% of women reported a history of HDP, and prevalence varied by racial/ethnic group (14% among NH-Black and Latina, 12% another race/ethnicity, 11% NH-White). Poor sleep characteristics were prevalent and more frequent among participants with a history of HDP (e.g., insomnia symptoms: 46% vs. 43% [no HDP]). Over a mean $\pm$ SD 12 $\pm$ 3.0 years of follow-up, there were 1,658 new cases of CVD. After adjustment, the association between HDP and higher risk of CVD (HR=1.40 [95% CI:1.22-1.60]) did not differ between participants with poor vs. non-poor sleep (all p-interactions > 0.05 ; e.g., short sleep: HRyes=1.41 [1.11-1.79] and HRno=1.34 [1.13-1.59]).

Conclusion: Using subjective measures, poor sleep during middle-to-older age did not appear to exacerbate risk of CVD associated with HDP. Future studies that include multiple dimensions of objective sleep measured over the life course are warranted to better elucidate how sleep health among parous women may impact CVD risk.

Support (if any): NIEHS (Z1AES103325[CLJ] and Z01ES044005 [DPS])

Abstract citation ID: zsad077.0820

0820**INTEGRATED POLYSOMNOGRAPHIC AND SLEEP SYMPTOM-BASED CLUSTER SUBTYPES ASSOCIATED WITH INCIDENT ATRIAL FIBRILLATION**

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Introduction: While sleep disorders are implicated in atrial fibrillation (AF), the interplay and overlap of these disorders in AF risk remains unclear and a risk stratification challenge. Sleep-based clusters associated with AF can account for this complexity and translate to actionable approaches to identify at-risk patients. We hypothesized discrete phenotypes of symptoms and polysomnography (PSG)-based data differ in relation to incident AF.

Methods: Cleveland Clinic patients (age>18) who underwent PSG 11/27/2004-12/30/2015 were retrospectively examined. Clusters were identified using latent class analysis of 23 symptoms (e.g. related to sleep disordered breathing (SDB), sleepiness, REM intrusion, NREM parasomnias), Epworth Sleepiness Scale (ESS) score, and 24 measures of SDB and sleep architecture from PSG reports. Outcome was 5-year incident AF. Cox-proportional hazards models were adjusted for age, sex, race, body mass index, cardiovascular disease and risk factors, tobacco use, chronic obstructive pulmonary disease, anti-arrhythmic medication use, and positive airway pressure use.

Results: The sample included 43,433 patients: age 51.8±14.5, 51.9% (n=22,548) male, 74.4% (n=32,313) White, 7.3% (n=3,151) with baseline AF, and 4.3% (n=1,875) developed 5-year incident AF. Five clusters were identified and ranked by strength of AF association: 1) Hypoxemic (n=3,245): highest %time SaO₂< 90% (T90), 2) Apneas+Arousals (n=4,592): most witnessed apneas, highest apnea hypopnea index (AHI), highest arousal index, least hypopneas, 3) Short sleep+NREM (n=6,126): shortest sleep time, longest REM latency, lowest %REM, 4) Hypopneas (n=2,661): most hypopneas, 5) Long sleep+REM (n=26,809): longest sleep time, shortest REM latency, highest %REM. Compared to 'Long sleep+REM', 'Hypoxemic' had 47% higher AF risk (HR=1.47, 95%CI=1.27-1.69), and 'Hypopneas' did not differ (HR=1.05, 95%CI=0.86-1.28).

Conclusion: Of five clusters identified, the 'Hypoxemic' subtype conferred the strongest AF risk with the highest degree of hypoxemia (highest T90, lowest minimum and mean SaO₂), maximum end-tidal CO₂, heart rate, and ESS score. Consistent with prior evidence of hypoxemia as an AF driver and cardiovascular risk of the sleepy phenotype, this constellation of symptoms and physiologic alterations illustrates risk in the clinical setting, providing potential value as a risk prediction tool. Future investigation should focus on external validation of these findings.

Support (if any): Cleveland Clinic Neurological Institute Center for Outcomes Research & Evaluation Pilot Grant, Transformative Research Resource Development Award

Abstract citation ID: zsad077.0821

0821**NIGHTTIME AVERAGE AND DIPPING BLOOD PRESSURE CAN DIFFER BASED ON THE TEMPORAL DISTRIBUTION OF AMBULATORY MEASUREMENTS AT NIGHTTIME**

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Introduction: Ambulatory blood pressure (BP) monitoring is recommended in preference to office BP as it enables BP assessments across the night and quantification of the degree of nocturnal BP dipping (dipping = nighttime/daytime BP of < 0.9; non-dipping = ≥0.9). Both nighttime BP and dipping% are independent predictors of adverse cardiovascular events. Standard guidelines recommend at least ≥20/7 daytime/nighttime measurements for reliable ambulatory BP monitoring, but newer reports suggest ≥8/4 daytime/nighttime measurements are sufficient. Considering BP oscillates across the night, the temporal distribution of measurements across the night may impact nighttime BP and dipping%. To test whether this new recommendation holds for extreme examples of temporal distribution, we compared average nighttime BP and dipping% when using BP measurements only in the first (1st-half) vs. only in the second half (2nd-half) of the night.

Methods: Seventeen females and twenty-six males (50±10 years [mean±SD]) without cardiovascular disease or severe sleep disorders wore an ambulatory BP monitor for 24 hours, programmed to measure BP every 20 minutes when awake and every 30 minutes during a self-selected 8-hour time-in-bed for nighttime. We compared the nighttime BP averages and the calculated dipping% when using the first four measurements from the 1st-half of the nighttime, from the 2nd-half of the nighttime, and all measurements during the nighttime (All nighttime, AN). Repeated measures ANOVA was conducted with significance set as p< 0.05.

Results: Systolic BP was higher using 1st-half than 2nd-half but similar to AN (111±9 vs. 107±11 vs. 109±9 mmHg, p< 0.01), while systolic BP dipping% using 1st-half was lower than 2nd-half and AN (9.7±7.4 vs. 13.0±7.6 vs. 11.4±6.7 %, p< 0.01, respectively). Diastolic BP and diastolic dipping% were similar among the 1st-half, 2nd-half, and AN segment (63±6 vs. 63±7 vs. 62±7 mmHg, p=0.19) and (17.2±7.6 vs. 17.2±8.8 vs. 18.4±8.8 %, p=0.16), respectively.

Conclusion: In adults without cardiovascular disease or severe sleep disorders, nighttime BP and dipping% may depend upon when BP measurements are taken. The minimum threshold of 4 measurements for a reliable nighttime BP readout should be used cautiously.

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0822**SLEEP AND NIGHTTIME URINE PRODUCTION**Shachi Tyagi¹, Becky Clarkson¹, Kandy Newell¹, Subashan Perera¹, Neil Resnick¹, Daniel Buysse¹¹ University of Pittsburgh Medical Center

Introduction: Nocturia (waking from sleep to urinate) is the most common cause of sleep interruption among older adults and nocturnal polyuria (NP; increased sleep time urine production) is its most common cause. Conversely, poor sleep with repeated awakenings contributes to both nocturia and NP. However, whether a behavioral intervention to reduce repeated awakenings can improve nocturia and NP has not been examined in a clinical trial. The current study assesses the effect of Brief Behavioral Treatment for Insomnia (BBTI) on nocturia and NP in older adults.

Methods: Fifty-six community-dwelling older adults (mean age, 72±6 years; 64% women) with nocturia frequency ≥2 per night were randomized to receive BBTI vs information-only control (IC). All participants completed a 3-day voiding and sleep diary to assess nocturia, and sleep. Participants with a nocturnal polyuria index (NPi; percent of 24-hour urine volume excreted at night) ≥35% were considered to have NP.

Results: At baseline, nocturia frequency correlated with total sleep time ($r=.54$, $p<0.001$) and duration of the first uninterrupted sleep period (FUSP, $r=-.40$, $p=0.004$) after adjusting for age and body mass index. BBTI significantly improved nocturia frequency compared to the IC group (-1.0 ± 0.7 vs -0.3 ± 0.9 ; $p=.02$). FUSP increased by 54 ± 77 minutes in the BBTI group and NPi decreased by $7.1\pm13.2\%$, but these changes were not significantly different from the IC group. Change in NPi correlated with change in FUSP ($r=-.36$, $p=.01$; longer FUSP associated with lower NPi), but not with change in total sleep time ($r=-.04$, $p=.7$).

Conclusion: In older adults with nocturia, behavioral treatment directed solely at sleep also improves nocturia. Improving sleep continuity in the first half of the night and increasing FUSP, but not total sleep time, may also improve NP.

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0823**SOCIAL DETERMINANTS OF SLEEP DISORDERS AMONG MULTIETHNIC AMERICANS IN THE NIH ALL OF US RESEARCH PROGRAM**Judite Blanc¹, Peter Barr², Azizi Seixas¹, Maurice Chery¹, Maritza Bernard³, April Rogers⁴, Girardin Jean-Louis⁵, Tim Bigdeli²¹ University of Miami Miller School of Medicine, ² SUNY Downstate Health Sciences University, ³ Saint Leo University, ⁴ St. John's University, ⁵ University of Miami

Introduction: Studies show that social characteristics associated with good health, such as a high level of education, being married, and being employed, are associated with healthier sleep health. Accordingly, we leveraged All of Us (AOU), an NIH research, to analyze sleep disorders prevalence and sociodemographic covariates.

Methods: Phecodes for diagnoses were derived from the ICD-9/10 billing codes in participants' electronic health records (EHRs). We used 0 phecodes of the parent category of sleep disorders (insomnia and sleep apnea) (phecode 327) in a person's EHR to classify individuals as not having a diagnosis and 2+ phecodes as having a diagnosis (those with only one instance in their EHR were dropped). Logistic regression analysis was conducted to assess associations between sleep disorders and race/ethnicity, sex, age, and education level using the R statistical framework.

Results: A total of 214,206 participants were available for analysis; of whom 61.3% were female (mean [SD] age, 51.7 [16.6] years). Women were 1.27x more likely to have a diagnosed sleeping problem (95% CI: 1.31, 1.23; $p=1.31\times10^{-61}$). We observed higher rates of sleep disorders in older individuals; compared to persons between 18-30 years old, those aged 65 years or older were 4.74 times more likely to have a diagnosable sleep disorder (95% CI: 3.83, 4.33; $p<10^{-300}$). We also observed a trend of greater education attainment corresponding to an increased likelihood of sleep problems; this was most extreme when comparing individuals with some college versus those who did not complete high school (OR=1.38; 95% CI: 1.30, 1.46; $p=3.65\times10^{-29}$). Individuals with reported income < 25K/year were 1.44x more likely to be diagnosed than those earning >100K (95% CI: 1.51, 1.37; $p=1.05\times10^{-51}$). Individuals identified as Black were least likely to have a diagnosis (OR=0.52; 95% CI: 0.50, 0.54; $p=2.2\times10^{-208}$).

Conclusion: Among All Of Us populations, self-identified Blacks, men, younger adults, higher-income, and non-college-educated patients are less likely to have recorded insomnia or sleep apnea diagnoses. Some of these unexpected within-group differences could be due to self-reported versus clinically recorded diagnoses and access to healthcare. Planned analyses aim to explore further social determinants of health by incorporating geospatial and available self-report data on exposures

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0824**THE EFFECT OF CBT-I DOSE ON SLEEP OUTCOMES IN CANCER SURVIVORS AT 3-MONTH FOLLOW-UP**Alexandria Muench¹, Elizabeth Lampe², Donn Posner³, Mark Seewald¹, Julia Boyle⁴, Ivan Vargas⁵, Michelle Thompson⁶, Michael Grandner⁷, Michael Perlis¹¹ Behavioral Sleep Medicine Program, University of Pennsylvania, ² Center for Weight Eating and Lifestyle Sciences (WELL Center), Drexel University, ³ Sleepwell Consultants, ⁴ New England Geriatric Research Education and Clinical Center, ⁵ Department of Psychological Sciences, University of Arkansas, ⁶ Office of the Vice Provost for Research Postdoctoral Fellow, Annenberg School for Communication, University of Pennsylvania, ⁷ Sleep & Health Research Program, Behavioral Sleep Medicine Clinic, University of Arizona College of Medicine

Introduction: Cancer-related fatigue (CRF) is highly prevalent during acute illness and survivorship, with almost 100% of cancer patients experiencing such symptomatology. While CRF commonly co-occurs with sleep disturbance during and/or after cancer treatment, CRF is (nevertheless) defined as occurring independent of sleep considerations. Last year it was reported

(based on preliminary findings from a pilot study), that CBT-I affects both sleep continuity and fatigue, with high dose CBT-I producing up to a 72% reduction in pre-to-post measures of Fatigue. The present analysis is based on a completed pilot study where we evaluate the durability of the anti-fatigue and sleep continuity effects of CBT-I in patients diagnosed with breast and prostate cancer.

Methods: This descriptive analysis (percent change from post-treatment to three month follow-up) includes 11 adult subjects (91% female; $\text{MAGE}=57.8\pm7.7\text{yrs}$). CBT-I was provided by a master CBT-I therapist via video conferencing (telehealth CBT-I). Subjects were asked to complete sleep diaries, and weekly measures of fatigue (FACIT), and insomnia severity (ISI) questionnaires. In order to evaluate durability, post-treatment scores were compared to three-month follow-up scores, where all subjects were typed for whether or not they retained > 90% of their clinical gains as assessed with the ISI and the FACIT.

Results: 82% of the subjects in our pilot study maintained their clinical gains with respect to fatigue and 64% maintained their gains with respect to insomnia.

Conclusion: This preliminary analyses suggest that clinical gains via CBT-I are remarkably robust for fatigue outcomes. The findings with respect to the ISI, while less robust, are within the range that is typical for insomnia RCTs (~70% of subjects maintain treatment responses at follow-ups). If these results are replicated, this may suggest that the anti-fatigue effects of CBT-I are more durable than the “insomniolytic” effects.

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0825

ASSOCIATION OF SLEEP DISTURBANCE AND PHYSICAL FUNCTIONING FOLLOWING ACUTE HOSPITALIZATION IN OLDER ADULTS

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Introduction: Three out of 10 older adults are admitted for acute care in U.S. hospitals where they are at risk for a rapid decline in physical function due to deconditioning. Identifying factors, such as sleep quality, that may be related to recovery of physical functioning is a key step in facilitating independence following hospital discharge. Thus, this study aimed to examine the association between sleep quality and functional recovery after an acute hospitalization in community dwelling older adults.

Methods: Participants ($n=52$; age $71.3 \pm 6.8\text{y}$, 75% female, 94.2% white), were recruited during an acute hospitalization. Participants completed sleep questionnaires including PROMIS Sleep-Related Impairment and Sleep Disturbance, as well as physical function testing and questionnaires, Short Physical Performance Battery (SPPB) and PROMIS Physical Function prior to hospital discharge (baseline) and at 4-weeks post-discharge (follow-up). Separate multivariate regression models were conducted to determine whether baseline sleep predicted physical functioning at follow-up as well as if pre-post hospital changes in sleep predicted pre-post changes in physical functioning.

Results: The PROMIS Sleep-Related Impairment score at baseline was inversely associated with SPPB Gait (0.02 ± 0.009 , $p=0.04$), SPPB Balance (0.02 ± 0.008 , $p=0.02$), SPPB Chair Stand (0.05 ± 0.02 , $p=0.006$) and Total SPPB (0.19 ± 0.04 , $p<.0001$) at follow-up. Similarly, baseline PROMIS Sleep Disturbance score was inversely associated with PROMIS Physical Function at follow-up (0.19 ± 0.07 , $p=0.008$). The change in PROMIS Sleep-Related Impairment was inversely associated with the change in Total SPPB (0.05 ± 0.03 , $p=0.03$), SPPB Balance (0.05 ± 0.02 , $p=0.01$) and PROMIS Physical Function (0.15 ± 0.06 , $p=0.012$) from baseline to follow-up. The change in PROMIS Sleep Disturbance was inversely correlated with the change in PROMIS Physical Function (0.11 ± 0.05 , $p=0.04$) from baseline to follow-up.

Conclusion: Together, these results demonstrated that self-reported sleep disturbance and daytime sleep-related impairments during and following hospitalization predicted physical functioning at 4-weeks post-discharge. Improving sleep during hospitalization may reduce hospital deconditioning and improve functional recovery.

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0826

CHRONOTYPE, UNHEALTHY LIFESTYLE, AND DIABETES RISK IN MIDDLE-AGED US WOMEN: A PROSPECTIVE COHORT STUDY IN NURSES' HEALTH STUDY II

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Introduction: Chronotype refers to one's inclination to earlier or later sleeping times. Late chronotype has been linked to increased diabetes risk, which may be mediated through adherence to unhealthy lifestyle. This study aimed to evaluate the interplay among chronotype, lifestyle factors, and diabetes risk.

Methods: In 2009, 63,594 diabetes-free women (mean age=54 yrs) from the Nurses' Health Study II self-reported their chronotype using a validated question from the Morningness-Eveningness Questionnaire and were prospectively followed for incident type 2 diabetes (T2DM) until June 2017. Unhealthy

lifestyle was defined by having < 4 of the following 6 healthy lifestyle factors: high diet quality (AHEI $\geq$ 49), physical activity ($\geq$ 3.5 MET-hours/week), moderate alcohol intake ($\geq$ 5 and < 15 g/day), normal body mass index ($\geq$ 18.5 and < 25 kg/m²), non-current smoking, and 7-9 hours of sleep. T2DM was self-reported and confirmed using a validated supplementary questionnaire. We used modified Poisson regression models to estimate the cross-sectional associations between chronotype and unhealthy lifestyle. Cox proportional hazards models were used to estimate the adjusted hazard ratios (aHR) for incident diabetes risk according to chronotype and assess the proportion of the association explained by lifestyle factors (mediation analyses).

Results: Participants reporting a “definitely-evening” type were 55% (95% CI: 1.51-1.60) more likely to have an unhealthy lifestyle compared with participants reporting a “definitely-morning” type. We documented 1,921 T2DM cases over 468,555 person-years of follow-up. With increasing eveningness, the risk of T2DM became significantly higher (Ptrend< 0.0001). Compared with the “definitely-morning” type, the aHR (95% CI) for T2DM was 1.10 (0.97-1.24) for “more-morning”, 1.01 (0.81-1.27) for “intermediate”, 1.26 (1.11-1.42) for “more-evening”, and 1.65 (1.44-1.90) for “definitely-evening” chronotypes, after adjusting for sociodemographic factors, shift-work, depression and family history of diabetes. Additional adjustment of unhealthy lifestyle explained 56.8% (95% CI: 39.4%-72.6%) of the association [aHR (95% CI) for “definitely-evening” versus “definitely-morning”: 1.27 (1.10-1.46)].

Conclusion: Women with a late chronotype are more likely to engage in unhealthy lifestyle behaviors. Late chronotype is prospectively associated with increased diabetes risk, which is partly explained by unhealthy lifestyle behaviors. Our results suggest that lifestyle interventions may potentially reduce the adverse impact of late chronotype on diabetes risk.

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0827

EFFECT OF VIRTUAL COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA ON PERCEIVED COGNITIVE FUNCTIONING AMONG CANCER SURVIVORS

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Introduction: Comorbid insomnia and perceived cognitive impairments (PCI) affect up to 26% of individuals diagnosed with cancer. Given the association between sleep and cognition, and the lack of interventions to improve PCI, the present study examined the impact of cognitive behavioral therapy for insomnia (CBT-I) on PCI among cancer survivors with insomnia disorder and cognitive complaints (clinicaltrials.gov:NCT04026048).

Methods: Cancer survivors (N=122) with insomnia and PCI were randomized to 7 weekly virtual CBT-I treatment sessions (n=56) or waitlist control (WLC: n=66). Participants completed the Insomnia Severity Index and the Functional Assessment of Cancer Therapy – Cognitive Function upon entering the study (baseline; T0), and then again at 4 (T1), and 8 (T2) weeks. A series of 2 (treatment group: CBT-I and

WLC) by 3 (time: T0, T1, T2) mixed ANOVAs were performed to assess changes in insomnia symptoms, PCI, perceived cognitive abilities (PCA), and impact of cognitive function on quality of life (QOL).

Results: Participants were, on average, aged 60 years, had 16 years of education, and 79% were female. Breast cancer was the most reported cancer type (46%). No significant differences were observed between groups at T0 for demographic or clinical variables (p>.05). There was a significant group by time interaction for insomnia [p<.001, partial eta squared (pes)=.36]. Individuals randomized to CBT-I reported significant decreases in insomnia symptoms post treatment compared to WLC (CBT-I: -11.5; WLC: -2.7). Significant interactions were also observed for PCI (p<.001, pes=.11), PCA (p<.001, pes=.16), and impact on QOL (p<.001, pes=.15). Participants randomized to CBT-I reported significantly less PCI (CBT-I: 14.7; WLC: 4.1), better PCA (CBT-I: 5.8; WLC: 1.1), and less impact on QOL (CBT-I: 4.9; WLC: 1.1) than participants in the WLC.

Conclusion: In addition to improving insomnia, CBT-I significantly improve perceived cognitive functioning and quality of life among cancer survivors. Further research is needed to understand the mechanisms underlying improvements in cognition following CBT-I.

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0828

GREATER SLEEP VARIABILITY IS ASSOCIATED WITH HIGHER SYSTEMIC INFLAMMATION IN TYPE 2 DIABETES

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Introduction: Circadian misalignment increased systemic inflammation in sleep experiments and in those performing shift work. Milder degree of circadian misalignment such as day-to-day shift in sleep timing, i.e. sleep variability, was related to inflammation in population studies. Further, other sleep disturbances and glycemic control can contribute to inflammation. This pilot study explored if sleep variability was associated with inflammation in type 2 diabetes (T2D).

Methods: Subjects included 35 non-shift working T2D patients with and without diabetic retinopathy (DR) who were participating in a clinical study (NCT04547439). Sleep pattern was assessed by 14-day actigraphy, yielding sleep duration and efficiency. Standard deviation of sleep duration across the night was used to represent sleep variability. Sleep apnea severity was assessed by an overnight home monitor. Neuropathy pain, statin use, serum creatinine, low-density lipoprotein (LDL), HbA1C and by high-sensitivity c-reactive protein (hs-CRP) were collected. Spearman's correlation analyses and multiple regression analysis (using natural-log transformed values) were performed to establish an independent association between sleep variability and hs-CRP.

Results: Mean (SD) age was 54.3 (6.4) years, 54.3% were female and 62.9% had DR. Median (interquartile range) of sleep variability was 69 (56,84) minutes. Median A1C was 7.5 (6.6, 8.7)% and hs-CRP was 2.4 (1.4, 4.6) mg/L. Higher hs-CRP was significantly associated with higher sleep variability ($r=0.342$, $p=0.04$), HbA1c ($r=0.431$, $p=0.01$) and LDL ($r=0.379$, $p=0.03$), but not with sleep duration, sleep efficiency, sleep apnea severity, DR status or other variables. Multiple regression analysis showed that higher sleep variability ($B = 0.91$, $p=0.034$) and higher HbA1c ($B = 1.51$, $p=0.035$), but not LDL, contributed to higher hs-CRP.

Conclusion: Higher sleep variability in non-shift working T2D patients was shown to be independently associated with higher systemic inflammation, conferring higher cardiovascular risk. This data supports the role of even a mild degree of circadian misalignment on systemic inflammation. Further investigations are needed to determine whether sleep intervention to increase sleep regularity can reduce systemic inflammation and improve cardiometabolic health.

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0829

INSOMNIA WITH OBJECTIVE SHORT SLEEP DURATION IS ASSOCIATED WITH HYPERTENSION

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Introduction: Insomnia with objective short sleep duration (ISSD) has been proposed as the most biologically severe phenotype of the disorder associated with cardiometabolic morbidity in population-based samples.

Methods: In this study, we investigated the association between ISSD and hypertension in a large clinical sample. We studied 348 patients diagnosed with chronic insomnia disorder (CID) based on International Classification of Sleep Disorders (ICSD-3) criteria and 150 normal sleepers. Objective short sleep duration was defined by the median total sleep time (TST) of the sample (< 7 hours) measured with 1-night polysomnography. Hypertension was defined based on blood pressure (BP) levels, antihypertensive medication use and/or a physician diagnosis.

Results: After adjusting for potential confounders, patients with CID who slept < 7 hours were associated with 2.8-fold increased odds of hypertension compared to normal sleepers who slept ≥ 7 hours (odds ratio [OR]=2.81, 95% confidence interval [95%CI]=1.068–7.411) or < 7 hours (OR=2.75, 95%CI=1.005–7.542), whereas patients with CID who slept ≥ 7 hours (OR=1.52, 95%CI=0.537–4.285) or normal sleepers who slept < 7 hours (OR=1.07, 95%CI=0.294–3.904) were not significantly associated with increased odds of hypertension compared to normal sleepers

who slept ≥ 7 hours. Linear regression analyses showed that, for every hour decrease in TST, systolic and diastolic blood pressure increased by 1.014 mmHg ($p=0.045$) and 0.923 mmHg ($p=0.015$), respectively, in patients with CID but not in normal sleepers.

Conclusion: Our findings further support that ISSD is a risk factor for hypertension and objective short sleep duration may be a useful marker of the biological severity of CID in clinical practice.

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0830

NOVEL OSA-DRIVEN METRIC PREDICTS INCIDENT DEMENTIA IN SLEEP APNEA IN TWO DIFFERENT COMMUNITY-BASED COHORT STUDIES

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Introduction: Obstructive sleep apnea (OSA) is associated with intermittent hypoxemia and sleep fragmentation. In OSA, sleep fragmentation is often measured by the number of electroencephalographic arousals per hour of sleep without considering their intensity. In this study, we sought to determine the association of “arousal intensity” with increased risk of dementia in two independent community-based cohorts: the Osteoporotic Fractures in Men Study (MrOS) and the Multiethnic Study of Atherosclerosis (MESA).

Methods: Arousal intensity was calculated from the baseline polysomnogram of the MrOS and MESA cohorts. We included participants with available data from baseline study to Visit 4 (median follow-up 10.7 [IQR: 10.3 – 11.1] years) in MrOS and from MESA Sleep to 2018 in MESA (median follow-up 6.8 [IQR: 6.2 – 7.3] years). Dementia at baseline or those who reported positive airway pressure therapy were excluded. The primary analysis assessed the association of arousal intensity with incident dementia (primary outcome). Dementia was defined as a significant change in the Teng Mini Mental Test plus self-report of medical diagnosis during the follow-up visit in MrOS and based on the ICD-9 codes from hospital discharge data in MESA. Multiple logistic regression analyses were used to obtain the adjusted odds ratio per 1 standard deviation increase in arousal intensity after adjusting for anthropometric/demographic variables, depression, alcohol, tobacco, and AHI.

Results: A total of 1,136 MrOS and 1,923 MESA participants with complete data were included, with a median age of 76 [IQR 72 – 80] years, (100% Male) and 67 [IQR: 61 – 75] years, (46.3% Male), respectively. In MrOS, 11.4% of men had events and

every 1SD increase in arousal intensity was associated with a 23% [95%CI: 0 to 50; $p < 0.05$] increased risk of incident dementia. In MESA, 3.5% of men had events and every 1SD increase in arousal intensity was associated with a 29% [95%CI: 1 to 65; $p < 0.05$] increased risk of incident dementia.

Conclusion: In two independent cohorts, high arousal intensity was associated with an increased risk of incident dementia after adjusting for relevant confounders. Quantifying arousal intensity may provide added value for cognitive risk stratification in sleep apnea.

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0831

SLEEP IN LONG-TERM CHILDHOOD CANCER SURVIVORS COMPARED TO SIBLINGS: A REPORT FROM THE CHILDHOOD CANCER SURVIVOR STUDY

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Introduction: Sleep problems following treatment for childhood cancer may persist into adulthood. Because some sleep problems increase with age, it is important to understand whether cancer elevates this risk and assess associations with co-morbidities that frequently develop in long-term childhood cancer survivors. The current study compares sleep in long-term survivors to sibling controls.

Methods: Childhood cancer survivors (≥ 5 years from diagnosis; $n=12,340$; 51.5% female; mean [SD] age=39.4 [9.6] years; years since diagnosis=30.9 [7.9]; age at diagnosis=8.5 [5.8]) and siblings ($n=2395$; 57.1% female; age=44.6 [10.5]) participating in the Childhood Cancer Survivor Study completed the Pittsburgh Sleep Quality Index (PSQI). Binary sleep behaviors (Total Score > 5 , Short Sleep Duration [< 6 hours], Frequent Snoring [> 3 times/week], Frequent Sleep Medication Use [≥ 3 times/week]) were compared between survivors and siblings using a multivariable generalized estimating equation with Poisson error to account for intra-family correlations, adjusting for age, sex, race, and BMI. Poisson regression models evaluated treatment and chronic health conditions (CHCs) as predictors of PSQI Total Score among survivors with the same adjustment variables.

Results: Survivors were more likely to report Short Sleep Duration (12.0% vs 10.6%; adjusted prevalence ratio [aPR] 1.18, 95% confidence interval [CI] 1.04-1.34), elevated PSQI Total Score (45.1% vs 40.0%; aPR 1.17, 95%CI 1.11-1.23), Frequent Snoring (18.0% vs 17.4%; aPR 1.11, 95%CI 1.01-1.23), and Frequent Sleep Medication Use (13.2% vs 11.5%; aPR 1.28, 95% CI 1.14-1.45) compared to siblings. Among survivors, elevated PSQI Total Score was associated with female sex (aPR 1.29, 95%CI 1.21-1.37) and BMI (overweight: aPR 1.13, 95%CI 1.06-1.22; obese: aPR 1.32, 95%CI 1.23-1.42), while age at diagnosis and cancer treatment exposures (i.e., chemotherapy/radiation) were not significantly associated. Survivors with 2+ CHCs had

increased prevalence of elevated PSQI Total Score (aPR 1.39, 95%CI 1.28-1.50) relative to survivors without CHCs.

Conclusion: Childhood cancer survivors exhibit elevated risk for poor sleep quality, short sleep, and snoring relative to siblings well into middle age. These sleep problems are driven by demographics and current chronic health conditions rather than prior treatment exposures. Elevated use of sleep-promoting medications suggests interest in managing sleep difficulties and an opportunity for future behavioral sleep intervention trials.

Support (if any): NCI 5U24CA055727-26 (PI: Armstrong)

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0832

ABOUT CLOCKS, SLEEP, PAIN AND THEIR INTERACTIVE ROLE IN TMJ OSTEOARTHRITIS - A CASE REPORT

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Introduction: As a major cause of disability among older people, Temporomandibular Joint Osteoarthritis (OA) remain a critical issue for both geriatric medicine and public health. While etiologic foundations of this condition are still unclear, it is well known that 24h-driven biological (circadian) rhythms are basic physiological requirements for the homeostatic control of peripheral tissues, such as skeletal muscle, bone and particularly cartilage. Sleep, as the most conspicuous circadian rhythm ruling health and wellbeing, is also relevant for anabolic and catabolic processes within cartilage, with nocturnal sleep regulating other factors from which depend important metabolic pathways. Pain, which is chronically coupled to OA is not only impacted by both circadian rhythms and sleep but is itself a contributor to circadian misalignment and sleep disruption which therefore increase pain propensity maintaining a deleterious vicious cycle. Hence, knowledge on such interactive structural and functional composition should be of great relevance both for preventing and successfully treating this chronic, debilitating, neurodegenerative disorder.

Methods: Authors are reporting an interesting case of a patient in which circadian disruption, impaired sleep and exacerbated persistent pain co-occur within OA. Sleep questionnaires (Insomnia Severity Index - ISI, STOP-BANG)

Results: NA

Conclusion: From this singular case, a chronobiological approach (phototherapy) directed to circadian alignment and sleep improvement showed to be effective both for general clinical improvement and for its long-term prognosis associated to OA.

Support (if any):

Abstract citation ID: zsad077.0833

0833**ACCEPTABILITY OF THE TRANSDIAGNOSTIC BEHAVIORAL SLEEP AND CIRCADIAN INTERVENTION TO INDIVIDUALS IN CARDIAC REHABILITATION**Caitlan Tighe¹, Angela Phares², Debra Weiner², Daniel Buysse³, Daniel Forman²¹ VISN ⁴ Mental Illness Research, Education, and Clinical Center, VA Pittsburgh Healthcare System, Pittsburgh, PA, ² VA Pittsburgh Healthcare System, ³ University of Pittsburgh Medical Center

Introduction: Sleep health is often compromised among individuals undergoing cardiac rehabilitation and does not consistently improve over the course of treatment. Behavioral sleep and circadian interventions may improve the sleep health of cardiac rehabilitation patients but have not been widely tested in this context. We conducted a preliminary test of an adapted version of the Transdiagnostic Sleep and Circadian Intervention (TransS-C) with Veterans in cardiac rehabilitation to evaluate its acceptability with these unique patients.

Methods: Eight Veterans with sleep disturbance and/or sleep-related impairment who were participating in outpatient cardiac rehabilitation completed the adapted TransS-C intervention and post-intervention acceptability measures. Intervention acceptability was assessed quantitatively with subscales from the Multidimensional Treatment Satisfaction Measure (subscale scores range from 0-4; higher scores indicate greater satisfaction) and qualitatively via semi-structured interviews. We calculated descriptive statistics for quantitative measures and analyzed semi-structured interviews using a rapid qualitative analysis approach.

Results: Participants felt the intervention was suitable to their needs ($M=3.00$, $SD=.94$) and useful for increasing their knowledge and understanding of sleep problems and how to manage them ($M=3.50$, $SD=.69$). Participants endorsed positive attitudes toward the intervention ($M=3.63$, $SD=.58$) and high likelihood of recommending the intervention to others similarly experiencing sleep problems ($M=3.63$, $SD=.58$). Following the intervention, 62.5% of participants indicated that their sleep disturbance and sleep-impairment were 'much better' than at the first study visit and 37.5% indicated their sleep disturbance and sleep-related impairment were 'somewhat better'. Qualitative findings converged with the noted quantitative findings.

Conclusion: Veteran cardiac rehabilitation patients expressed satisfaction and positive attitudes toward the adapted TransS-C intervention. All participants reported subjective post-intervention improvements in sleep disturbance and sleep-related impairment. These findings provide preliminary support for further large-scale testing of adapted TransS-C in cardiac rehabilitation.

Support (if any): Dr. Tighe is supported by a Career Development/Capacity Building Award (IK2 RX003393) from the United States Department of Veterans Affairs Rehabilitation R&D (Rehab RD) Service. This material is the result of work supported with resources and use of facilities at the VISN 4 Mental Illness Research, Education, and Clinical Center at VA Pittsburgh Healthcare System.

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0834**ASSOCIATION OF SLEEP DISORDERED BREATHING AND HEMODYNAMICS OF WORLD SYMPOSIUM ON PULMONARY HYPERTENSION GROUPS IN PVDOMICS COHORT**Kaitlyn Musco¹, Lu Wang¹, Nicholas Hill², Emanuel Finer³, Reena Mehra⁴¹ Cleveland Clinic, ² TUFTS university, ³ Cleveland Clinic Heart, Vascular, and Thoracic Institute, ⁴ Sleep Disorders Center, Neurological Institute, Cleveland Clinic

Introduction: As sleep disordered breathing(SDB)-related pathophysiology of intermittent hypoxia, autonomic dysfunction and intrathoracic pressure alterations, etc. likely exerts differential influences across World Symposium on Pulmonary Hypertension(WSPH) groups that have yet to be characterized, we postulate differing SDB-pulmonary hemodynamics relationships across these groups.

Methods: Pulmonary Vascular Disease Phenomics(PVDOMICS-NCT02980887), a multicenter cohort study, included patients with mean pulmonary artery pressure(mPAP) on right heart catheterization(RHC) ≥ 25 mmHg and home sleep apnea testing(HSAT) within 6 weeks of RHC. SDB measures included apnea-hypopnea index(AHI, 3% desaturation hypopnea definition used) and % recording time $< 90\%$ SpO₂(TRT $< 90\%$). Pulmonary hemodynamic indices included:mPAP, mean pulmonary capillary wedge pressure(PCWP), right atrial mean pressure(RAP). Linear regression models(beta coefficients $\pm$ standard error) were constructed to assess sleep indices and RHC measurements with adjustment for age, sex, race, body-mass index(BMI), PH medication and supplemental oxygen use; PH group interaction was analyzed.

Results: We included 424 participants with available data in the final analytic sample. Groups 2 and 3 were older(65.6 ± 11.9 , 64.2 ± 10.8 years, respectively) and Group 5 had the highest % males(71.4%). Group 2 had highest BMI: 34.3 ± 9.2 kg/m² and Group 5 lowest: 28.7 ± 6.4 kg/m². SDB(AHI ≥ 5), was most prevalent in Group 2(71.4%) and least in Group 4(42.9%). TRT $< 90\%$ was highest in Group 1(37.0%, [P25=2.2, P75=87.3]) followed by Group 4(35.7% [5.3,82.9]) and lowest in Group 2(6.4% [0.61,41.8]). AHI and RAP association differed across groups, $p=0.027$ and was strongest in Group 2; per 5-unit increase in AHI, RAP increased by 0.75mmHg (estimate=0.75, standard error[0.15,1.36], $p=0.015$). TRT $< 90\%$ and mPAP had significant cross-group differences, $p=0.004$. TRT $< 90\%$ was associated with mPAP in Groups 1 and 4:per 5-unit increase in TRT $< 90\%$, mPAP increased by 2mmHg(2.10,[1.52,2.68], $p< 0.001$) and 1.4mmHg(1.40,[0.07,2.73], $p=0.039$) respectively. Other associations were not significant.

Conclusion: SDB prevalence differs across WSPH groups and was highest in Group 2 PH. Findings suggest that AHI and TRT $< 90\%$ SaO₂ differentially contribute to the pathogenesis in PH groups; with AHI associating with RAP, especially in Group 2 PH, and TRT $< 90\%$ SaO₂ with mPAP in Groups 1 and 4 PH, perhaps via hypoxia-induced pulmonary vasoconstriction and remodeling.

Support (if any): Funding: U01 HL125218, U01 HL125205, U01 HL125212, U01 HL125208, U01 HL125175, U01 HL125215, and U01 HL125177 and the Pulmonary Hypertension Association.

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0835

CANCER PATIENT-CAREGIVER DYAD REPORTS OF INSOMNIA, DEPRESSION, ANXIETY, SYMPTOM MANAGEMENT AND HEALTHCARE UTILIZATION

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Introduction: More than 1.9 million new cases of cancer were diagnosed in 2022; 30,210 of those were in Alabama. Both caregivers and patients report high levels of insomnia, depression, anxiety and stress that can be linked to a cancer diagnosis, cancer therapies, and the stressful cancer journey. Insomnia, depression, and anxiety may lead to poor symptom management at home and inappropriate (over or under) utilization of healthcare resources. However, these relationships in cancer patients and family caregivers need further exploration. This cross-sectional study is using a community-engaged research approach to gather data to support the development and testing of a model of these relationships and targeted interventions.

Methods: Caregiver-patient dyads are being recruited at a rural oncology clinic. Each dyad completes a role specific survey one-time during a clinic visit. Sleep is assessed with PSQI and ISI, Depression with PHQ-9, Anxiety with GAD-7, and Stress with PSS. Healthcare resource utilization is captured by self-report. Caregivers report patient symptoms and level of confidence with home symptom management. Patients report quality of life with FACT-G. Target enrollment is 50 dyads for the full study.

Results: To date we have enrolled 33 patient-caregiver dyads (66% of target). Sleep quality (PSQI) and insomnia levels (ISI) ranged from no difficulties to significant difficulties for both groups. Similar variances in depression (PHQ-9), anxiety (GAD-7), and perceived stress (PSS) have been reported. On these measures, some dyad members appeared to mirror each other, whereas others reported vast differences. Caregivers who reported a greater number of patient symptoms tended to report lower levels of confidence in home symptom management. Approximately 50% of the participants have reported healthcare resource utilization, with a majority reporting little to no use of healthcare services. Indicating possible underutilization.

Conclusion: The cancer journey impacts both patients and caregivers. However, the impact is reflected differently in each member of the dyad. More research is needed to explore the individual and dyadic experiences along the cancer journey and to model the relationships to develop effective interventions for both the cancer patient and family caregiver.

Support (if any): Project funding- Office of Research & Economic Development, University of Alabama.

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0836

CHRONIC PAIN WORSENS DAYTIME SLEEPINESS, INSOMNIA AND QUALITY OF LIFE IN VETERANS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Chronic noncancer pain (CP) commonly co-occurs with obstructive sleep apnea (OSA) and may contribute to greater symptom burden. The study aim was to examine differences in sleepiness (Epworth Sleepiness Scale, ESS), insomnia symptoms (Insomnia Severity Index [ISI]), and quality of life (Short Form Health Survey 20, SF-20) in veterans with OSA with or without pre-existing CP.

Methods: An observational, cross-sectional, study of veterans with newly diagnosed, untreated OSA was conducted. Unadjusted between-group comparisons (i.e., OSA-only versus OSA + CP) were conducted using the Welch's t-test and Pearson Chi-Square. Regression analyses were performed to determine the influence of self-reported CP on sleep-related symptoms and quality of life while controlling for potential confounders (i.e., age, sex, OSA severity, body mass index, percentage of total sleep time spent with SpO₂ < 90%, and presence of psychiatric/mental health comorbidities). The Hochberg (step-up) method was used to control for the family-wise error rate at 5%.

Results: The final sample included N=111 participants with complete survey responses. Compared to the group with OSA-only (n=40), veterans with comorbid OSA and CP (n=71) experienced significantly higher ESS (12.7 ± 5.5 vs 10.2 ± 5.2 ; $p = .021$) and ISI scores (18.1 ± 6.2 vs 13.7 ± 7.4 ; $p = .002$), and worse quality of life across all SF-20 domains. Of note, clinically significant insomnia (ISI score > 15) was most common among veterans with comorbid OSA and CP (68.7% vs. 45.5%, $p = .010$). In adjusted analyses, CP diagnosis was significantly associated with higher ESS (adjusted mean difference [95% CI] = 2.72 [0.55, 4.88], $p = .014$) and ISI scores (adjusted mean difference [95% CI] = 3.82 [1.27, 6.37], $p = .004$).

Conclusion: There is a high prevalence of CP among veterans with OSA and symptom burden is higher in patients with OSA and CP. Future investigations should address symptom response and burden to OSA treatment in comorbid OSA and CP to guide outcome expectancies and residual OSA symptom treatment plans. Support (if any): SRSF Small Research Grant Award: 05-SRG-20. University of Pennsylvania School of Nursing, Office of Nursing Research.

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0837**COULD SLEEP QUALITY AND EXCESSIVE SLEEPINESS BE ASSOCIATED WITH KNEE PAIN? A CROSS-SECTIONAL STUDY**

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Introduction: Osteoarthritis (OA) is common among the older population, and sleep deprivation and depression appear to be associated with worse OA pain. The scientific literature is inconsistent in respect of overall sleep quality and daytime sleepiness in studies that consider knee pain specifically. To examine the association between sleep quality, daytime sleepiness and knee pain in older adults.

Methods: This was a cross-sectional study. The sleep quality was assessed by Pittsburgh Sleep Quality Index (PSQI) and sleepiness was evaluated by Epworth Sleepiness Scale. Older adults with knee pain classified as having OA according to the National Institute for Health and Care Excellence (NICE) guidelines. Eligibility criteria were preserved cognitive functions and being over 60 years old. Logistic regression analyses, adjusted for potential covariates (age, body mass index and sex), were performed to assess potential associations between sleep parameters and knee pain.

Results: The total sample was 451 older adults. Poor sleepers were associated with knee pain (OR=1.93, 95%Confidence interval [CI]: 1.26 to 2.99). Participants with daytime sleepiness were related with knee pain (OR=1.68, 95%CI: 1.100 to 2.80).

Conclusion: Sleep quality and daytime sleepiness were correlated with knee pain in the older adults. Social sleep education strategies for patients with knee pain may be important for pain control. Therefore, these variables are important in the management of patients with knee pain. Future studies should investigate whether there is a prognostic relationship between sleep quality and knee pain in the older population.

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0838**DIAGNOSED PREVALENCE OF IDIOPATHIC HYPERSOMNIA AMONG ADULTS IN THE UNITED STATES**

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Introduction: Idiopathic hypersomnia (IH) is a rare neurologic disorder that can cause debilitating symptoms, including excessive daytime sleepiness, severe sleep inertia, prolonged nighttime sleep, long and unrefreshing naps, and cognitive dysfunction. Research reporting the burden of IH is scant. The objective of this study was to estimate the diagnosed prevalence of IH among US adults between 2019 and 2021.

Methods: Symphony Integrated Dataverse® administrative claims between November 2015 and December 2021 were analyzed. Eligible patients were aged ≥18 years and had 1 medical or prescription claim in the calendar year of interest (2019, 2020, or 2021) and in the year prior. Diagnosed prevalence included all IH cases observed in eligible patients through the last day of the year of interest. IH cases were defined as eligible patients with ≥1 medical claim containing an IH diagnosis code in any position before or during the calendar year of interest, and no history of cataplexy. Unweighted prevalence estimates were reported per 100,000 persons with 95% confidence intervals (CIs). Age- and sex-adjusted prevalence estimates were calculated using 2019 US Census Bureau data.

Results: Over 158, 168, and 187 million adults were eligible for assessment of diagnosed prevalence of IH in 2019, 2020, and 2021, respectively. The unweighted diagnosed prevalence of IH was 32.12 per 100,000 persons (CI: 31.84, 32.40), 35.71 per 100,000 persons (CI: 35.43, 36.00), and 37.03 per 100,000 persons (CI: 36.75, 37.30) in 2019, 2020, and 2021, respectively. The estimated standardized numbers of US adults diagnosed with IH were 80,603 (CI: 80,048, 81,161), 89,539 (CI: 88,954, 90,127), and 92,139 (CI: 91,545, 92,736) in 2019, 2020, and 2021, respectively.

Conclusion: To our knowledge, this is the most recent study to estimate diagnosed prevalence of IH in US adults. It is uncertain what proportion of IH cases remain undiagnosed considering the under-recognition of this condition, low utilization of sleep testing, and concerns over the reliability of multiple sleep latency testing. Furthermore, recent studies suggest only a subset of patients with IH actively seek medical care for their condition. Given its impact on patients' lives, further research to improve surveillance of IH symptoms is needed.

Support (if any): Jazz Pharmaceuticals.

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0839**DOES CBT-I DOSE IMPROVE DEPRESSION AND ANXIETY IN PATIENTS DIAGNOSED WITH BREAST AND PROSTATE CANCER?**

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Introduction: It has been widely reported in the literature that insomnia, depression, and anxiety are reciprocally related, and that CBT-I not only improves insomnia but also symptoms of depression and anxiety. With respect to cancer, patients often report high co-morbidity of insomnia, fatigue, depression, and anxiety, with fatigue occurring in almost all patients diagnosed with cancer (irrespective of diagnoses and staging) and extending well into survivorship. The underlying mechanisms of fatigue are not well understood and, as such, there could be many contributing factors (e.g., insomnia and mood disturbance). The present analysis is based on a pilot study evaluating whether sleep continuity and CRF is improved by CBT-I dose (4 & 8 [Low dose] vs 10 & 12 [High dose] sessions). The present analysis evaluates whether dose of CBT-I effects depression and anxiety in patients diagnosed with breast and prostate cancer.

Methods: This descriptive analysis (percent change from pre to post treatment) includes 12 adult subjects (83.3% female, Mage 58.4±7.5yrs.; [Low dose, n=6], [High dose, n=6]). CBT-I was provided by a master therapist via video conferencing (telehealth CBT-I). Subjects were asked to complete sleep diaries and weekly measures of fatigue (FACIT), insomnia severity (ISI), depression (PHQ-9), and anxiety (GAD-7).

Results: On the PHQ-9, subjects in the Low dose group exhibited a 57% improvement and subjects in the High dose group had a 52% improvement. On the GAD-7, this corresponded to a 26% improvement (High dose group) and 25% improvement.

Conclusion: As increasingly reported in the literature, CBT-I produced robust effects on depression as assessed by the PHQ-9. The effects on anxiety appear to be less robust. This may be the case because CBT-I's effects on fatigue are likely to impact a variety of depressive symptoms, where this is less the case for anxiety. Analyses are ongoing, where the relative effects will be adjusted for insomnia-related items and rendered in terms of effect sizes.

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0840

EXPLORING THE RELATIONSHIP BETWEEN SLEEP DISTURBANCES AND ALZHEIMER'S DISEASE USING MACHINE LEARNING

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Introduction: Alzheimer's Disease (AD) is one of the most common neurological diseases, affecting about 50 million people

worldwide. Despite its prevalence and many promising recent developments, the factors that contribute to AD are still poorly understood. In this study, we examined the influence of sleep disturbances (sleep apnea, insomnia, and poor sleep quality) on the chances of developing AD and conversion from normal cognitive functioning (NL), to mild cognitive impairment (MCI) to AD, using the ADNI dataset and state-of-the-art machine learning models.

Methods: We conducted a series of Random Tree classifiers to determine whether sleep disturbances predicted changes in cognitive status (NL, MCI, or AD). Using three sleep target variables OSA, insomnia, and Neuropsychiatric Inventory's sleep related questions (NPIK) markers, participants that were surveyed for sleep patterns (n=1848) self-declared if they have insomnia (n=49), obstructive sleep apnea (OSA) (n=65), or poor sleep quality via NPIK (n=114). NPIK contains 11 variables, including OSA and NPIK, we explored a total of 7089 observations. Following that, a logistic regression and k-nearest neighbor (KNN) model using only the NPIK questionnaire as NPIK provides a rich and coherent inventory of sleep parameters.

Results: Based on Random Tree classifiers, the best model predicted a change from MCI to AD with an accuracy of 70%. Logistic regression and KNN models predict that caregiver distress, frequency of sleep disturbances and excessive daytime sleepiness play important roles in worsening the cognitive functioning status from MCI to AD. For the MCI patients, a random forest model with 60% accuracy predicted re-conversion from MCI to NL. Caregiver distress, frequency of sleep disturbances, and OSA predicted re-conversion from MCI-NL, and was most pronounced among males.

Conclusion: Our research broadly suggests that sleep disturbances increases Alzheimer's disease risk. However, the data on sleep in the ADNI dataset has limitations. All markers for sleep were subjectively reported by the patients or their caregivers and were not verified with objective observations. Further research under clinical conditions would be of value to find conclusive evidence of sleep disturbance as a risk factor for Alzheimer's Disease.

Support (if any):

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0841

FEASIBILITY OF ACTIGRAPHY DURING A DAYTIME BRIGHT PILOT STUDY IN THE MEDICAL ICU

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Introduction: Medical intensive care unit (MICU) light patterns are inadequate for proper circadian alignment. Sleep disruption and circadian misalignment are observed in MICU patients and adversely impact patient outcomes. We sought to establish the feasibility of using longitudinal actigraphy to measure diurnal rest-activity patterns, as a in the context of a pilot study evaluating daytime bright light (DBL). In an exploratory manner, we analyzed diurnal rest-activity characteristics.

Methods: Patients >50 years admitted to the MICU without pre-existing circadian disruption were enrolled. An actigraph was placed (wrist) on study day 1 (D1) and remained for up to 5 days. DBL exposure (>1200 lux, 5000K) began at 09:00 on D2 and continued until D5 (varied lengths of exposure among patients). Actigraphy feasibility was assessed via (1) total recording duration and (2) proportion of total recording with activity data (e.g., proportion of epochs on wrist with data capture). In an exploratory analysis, we evaluated rest-activity characteristics from D1 and D2 for fit with gamma distribution cosinor analysis. Characteristics included ratio of day/total activity, mesor (midline estimation statistic of circadian rhythm), and circadian quotient (normalized amplitude/mesor).

Results: Thirteen of fourteen enrolled patients completed actigraphy. Mean (SD) age was 74 (11) years. Mean APACHE II illness severity score was 21 (4). Patients had a mean 3.7 (1.3) days of actigraphy recording and a mean activity data proportion of 92% (16%). There were only two reports of temporary actigraph removal related to patient care. All actigraphy patients had fit using cosinor analysis. D1 median (IQR) day/total ratio was 0.76 (0.68,0.82), mesor was 10.31 (6.36,13.00), and circadian quotient was 0.82 (0.48,0.99). D2 (after DBL start) median (IQR) day/total ratio was 0.76 (0.64,0.78), mesor was 11.90 (8.97,15.83), and circadian quotient was 0.89 (0.65,0.95).

Conclusion: Here we demonstrate the feasibility of actigraphy as a measure of diurnal rest-activity patterns in MICU patients based on successful collection and analysis of data in all patients. While cohort size remains a limitation of this study, Actigraphic rest-activity patterns are being explored in an ongoing RCT evaluating the impact of DBL versus usual light exposure on circadian rhythms in critical illness.

Support (if any): K23HL138229, AASM Foundation

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0842

FEASIBILITY OF DAYTIME BRIGHT LIGHT EXPOSURE AND URINARY 6-SULFATOXYMELATONIN PROFILING IN THE MEDICAL ICU: A PILOT STUDY

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Introduction: Bright daytime light, dim evening light, and near darkness during sleep are optimal lighting conditions to support circadian physiology, wakefulness, and sleep. Such light patterns are absent in the medical intensive care unit (MICU) and are considered one factor contributing to the delayed circadian timing observed in MICU patients. We, therefore, conducted a pilot trial assessing the use of daytime bright light (DBL) in the MICU and tested the feasibility of using urinary 6-sulfatoxymelatonin (aMT6s) as a marker of circadian phase and amplitude.

Methods: We enrolled patients aged >50 years admitted to the MICU without pre-existing circadian disruption. Urine samples were collected every 4 hours starting on study day 1 (D1). Patients were randomized to receive bright light (>1200lux at the angle of gaze, 5000K) for 4 hours or 8 hours starting at 09:00 on

D2. Circadian metrics of aMT6s amplitude and acrophase were calculated via gamma distribution cosinor analysis.

Results: Eight (6 males, 2 females) out of 14 pilot participants produced sufficient urine for sampling; one was subsequently excluded due to exogenous melatonin use. Of the seven patients in the analysis, one did not have significant cosinor fit. Mean (SD) age was 74 (9) years and APACHE II illness severity score was 24 (4). D1 median (IQR) aMT6s amplitude was 29,389ng (447-125,874ng) and acrophase was 12:42 (8:30-13:54). D2 (after DBL start), median amplitude was 847,381ng (372-1,694,391ng) and acrophase was 04:36 (03:06-06:06). Six patients received 4-hours and two patients received 8-hours of DBL. Sample size was inadequate for testing differences in circadian outcomes between light assignments and study days.

Conclusion: DBL may promote earlier circadian timing and greater circadian amplitude in critically ill patients. Findings support feasibility of aMT6s in assessing circadian phase and amplitude in MICU patients who produce urine; however, a significant proportion of MICU patients are anuric. Consequently, sample size limitations, potential for masking, and infrequent urine sampling warrant further investigation. These pilot findings have influenced the frequency of aMT6s sampling (e.g., change to hourly) in an ongoing RCT evaluating the impact of DBL versus usual light exposure on circadian rhythms in critical illness.

Support (if any): K23HL138229, AASM Foundation

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0843

IDENTIFYING THE MINIMUM NUMBER OF AMBULATORY BLOOD PRESSURE MEASUREMENTS TO CLASSIFY A RELIABLE BLOOD PRESSURE DIPPING STATUS

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Introduction: Ambulatory blood pressure monitoring (ABPM) is recommended over office BP assessment as it enables quantification of the degree of nocturnal BP dipping (classifications: “dipping” = nighttime/daytime BP of < 0.9; “non-dipping” = ≥0.9), a robust predictor of future adverse events. However, ABPM can cause discomfort jeopardizing adherence to the 24-hour assessment. Current guidelines recommend at least 20/7 daytime/nighttime BP measurements for reliable classification of nocturnal dipping status, but recent reports suggest 8/4 daytime/nighttime measurements may be sufficient. This threshold for classification can reduce patient burden and potentially enhance clinical practice. We aimed to identify the minimum number of ambulatory BP measurements to determine a reliable dipping status.

Methods: Forty-three ostensibly healthy participants (50±10 years [mean±SD]) wore an ambulatory BP monitor for 24 hours with measurements every 20/30 minutes during the daytime/nighttime, respectively (maximum 48/16 daytime/nighttime measurements). We calculated each participant's dipping status using all available systolic BP measurements. We randomly selected 20-daytime plus 8-nighttime measurements, identified dipper statuses from all possibilities of 1-20 daytime and 1-8 nighttime measurements separately, and calculated the proportion of participants whose dipping status remained unchanged. We then evaluated all possible combinations starting with a

minimum of 8 daytime/5 nighttime for consistency with participants' full data set using a second random selection of 20/8 measurements

Results: We found that using 8-daytime (plus all available nighttime) measurements was sufficient for unchanged dipper status in 90% of possible combinations, and using 5-nighttime (plus all available daytime) measurements was sufficient for unchanged dipper status in 92% of possible combinations. Confirmatory analyses revealed that 8/5 daytime/nighttime combinations correctly identified dipper status in 84% of the >7 million combinations. 10/8 daytime/nighttime combination improved this to 86%, similar to 87% returned from the guidelines' recommended combination of 20/7 daytime/nighttime measurements.

Conclusion: In ostensibly healthy people, current thresholds for ambulatory BP monitoring recommendation could result in ~13% misclassifications of dipping status compared to full datasets. However, considering that this measurement can cause discomfort and that dipping statuses can be unstable in 30% of individuals, 10/8 daytime/nighttime measurements may be a reliable alternative.

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0844

IMPACT OF OBSTRUCTIVE SLEEP APNEA ON PATIENTS ADMITTED WITH INFLUENZA VIRAL PNEUMONIA, A NATIONWIDE STUDY

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Introduction: There is evidence of increased risk of admission with influenza in patients with untreated obstructive sleep apnea (OSA). There is however limited evidence of the impact of OSA on patients admitted with influenza pneumonia. We aim to study this association on a nationwide scale.

Methods: Using the National Inpatient Sample (NIS) Database from 2017 to 2020, a retrospective study of adult patients with principal diagnosis of influenza viral pneumonia with secondary diagnosis with or without obstructive sleep apnea (OSA) according to ICD-10 codes. Several demographics, including age, race, and gender, were analyzed. The primary endpoint was mortality, while the secondary endpoints included mechanical intubation, length of stay in days, and patient charge in dollars. Multivariate logistic regression model analysis was used to adjust for confounders, with a p value less than 0.05 considered statically significant.

Results: The study included 174,339 patients admitted with an influenza pneumonia, 13,094 of which had OSA. The Mean age for patients with and without OSA was 67 and 70 years, respectively. In the OSA group, 48% were females compared to 55% in the non-OSA group. Around 73% in both groups were Caucasian white. Statistically significant comorbidities noticed in the OSA group included chronic kidney disease (29% vs. 22%), Diabetes Mellitus (48% vs. 31%), COPD (47% vs. 31%). In-hospital mortality rate was not higher in the OSA group with statistical significance (2.1% vs. 2.3%, p = 0.48). The adjusted Odds ratio

was 0.51 without statistical significance. In-hospital mechanical ventilation and tracheotomy rates were higher in the OSA group with statistical significance (5.3 % vs. 3.7%, p < 0.01) (0.31 % vs. 0.12%, p 0.013) however the adjusted odds ratio was not statistically significant in either (aOR 1.27, p value 0.14). (aOR 0.9, p value 0.98). The length of stay was higher in the OSA group (5.5 vs. 4.9 days, adjusted means +0.4 days, p value 0.04) Patients in the OSA group had a higher total charge (59,949\$ vs. 44,091\$, adjusted means +1,997\$ p value 0.45)

Conclusion: Patients admitted with influenza viral pneumonia with associated OSA were not found to have worse clinical outcomes and a higher economic burden.

Support (if any):

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0845

INDIVIDUALS WITH PERSISTENT LOW BACK PAIN HAVE LESS TIME IN DEEP SLEEP STAGE THAN ASYMPTOMATIC CONTROLS

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Introduction: Sleep consists of stages of light sleep, deep sleep, and rapid eye movement (REM), which have different characteristics. These stages are thought to be associated with different physiological and psychological processes. Pain is an unpleasant sensory and emotional experience generated by neural activity that potentially impacts several networks in the brain. There is limited information regarding the potential association between objectively determined sleep characteristics and persistent low back pain (pLBP). The purpose of this study was to examine whether sleep characteristics differ between individuals with pLBP and asymptomatic controls.

Methods: Individuals in a current episode of back pain with symptoms impacting function and persisting greater than 3 months (pLBP group, n=20) and asymptomatic individuals (control group, n=16) participated in the study. They wore a home sleep test device (Zmachine® Insight+, General Sleep Corporation) for three nights.

Results: The pLBP and control groups had similar age (24.8 ± 5.8 and 25.4 ± 4.3 years, respectively; mean ± SD), height, weight, and waist and hip circumferences. The two groups also had similar total sleep time (6.0 ± 1.2 and 6.6 ± 1.0 hours, for pLBP and control groups, respectively), sleep efficiency (82.8 ± 8.8% and 84.9 ± 5.7%), and wake time after sleep onset (35.8 ± 27.4 and 31.5 ± 18.1 minutes). The duration in REM (1.5 ± 0.5 and 1.5 ± 0.6 hours) and light sleep (3.1 ± 0.7 and 3.4 ± 0.9 hours) stages were also similar. However, the pLBP group had less deep sleep time (1.4 ± 0.4 hours) than the control group (1.7 ± 0.3 hours) (p = 0.029).

Conclusion: Individuals with pLBP had less deep sleep time than asymptomatic controls, although other objectively determined sleep characteristics appear to be similar. These results suggest an association between the deep sleep stage and persistent low back pain that requires further investigation.

Support (if any): National Institutes of Health R01HD095959 and University of South Carolina ASPIRE 80004373.

Abstract citation ID: zsad077.0846

0846**PREVALENCE OF OBSTRUCTIVE SLEEP APNEA AMONG MEDICAL ICU PATIENTS**Madeline Ehrenberg¹, Kullatham Kongpakpaisarn², Taylor Intihar², Margaret Doyle², Melissa Knauert³¹Yale University School of Medicine, ²Department of Internal Medicine, Yale University School of Medicine, ³Department of Internal Medicine, Yale University School of Medicine, New Haven, CT.

Introduction: The prevalence of Obstructive Sleep Apnea (OSA) among medical intensive care unit (MICU) patients is unknown. However, OSA prevalence in the general population and in conditions that are frequently comorbid in ICU populations (e.g., diabetes and cardiovascular disease) suggests that OSA may be common among MICU patients. Our objective is to prospectively examine the prevalence and severity of OSA in patients admitted to a tertiary academic MICU.

Methods: This was a prospective observational study that included patients admitted to the MICU from July to December 2022. Patient charts were reviewed for patient demographics, clinical characteristics, and evidence of pre-existing OSA. Pre-existing OSA was assessed via in depth review of the electronic medical record and included data fields such as the past medical history, documentation of OSA treatment, description of OSA diagnosis in outpatient provider notes, and/or sleep study records. Based on chart review, we also assigned confidence ratings for the OSA diagnosis (high versus low) and noted patients for whom outpatient providers had a high clinical suspicion for OSA in the absence of definitive sleep evaluation.

Results: Herein, we present preliminary analysis of 345 MICU patients. Mean age (SD) was 64 (18) years; 49% were female, 23% were Black, and 67% were White. Acute respiratory failure (36%) and septic shock (24%) were the leading reasons for admission. Mean (SD) APACHE II severity of illness score was 19.6 (8.8) and body mass index was 27.5 (8.5). Pre-existing OSA was identified in 19% of patients; 63% of pre-existing OSA patients were characterized as “high confidence” in OSA diagnosis. An additional 6% of patients had high clinical suspicion of OSA. Severity data was sparse in the chart with only 17% of OSA patients having severity data available; OSA severity distribution was as follows: mild 9%, moderate 27%, and severe 64%.

Conclusion: Our preliminary analysis indicates that OSA is notably prevalent among MICU patients. We hypothesize that OSA is under-recognized and consequently undertreated in MICU patients. With this in mind, future directions include investigation of the recognition, treatment, and outcomes related to pre-existing OSA in critically ill patients.

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0847**REAL-WORLD IDIOPATHIC HYPERSOMNIA TOTAL HEALTH MODEL (RHYTHM): CLINICAL BURDEN OF PATIENTS DIAGNOSED WITH IDIOPATHIC HYPERSOMNIA**Prasheel Lillaney¹, Ragy Saad², Deb Profant², Douglas Fuller², Trevor Alvord³, Patricia Prince³, Marisa Whalen², Wayne Macfadden², Weiwei Ni², Jed Black⁴¹ Former employee of Jazz Pharmaceuticals, ² Jazz Pharmaceuticals, ³ Action, Inc., ⁴ Jazz Pharmaceuticals; Stanford University Center for Sleep Sciences and Medicine

Introduction: Idiopathic hypersomnia (IH) is a rare neurologic disorder that can cause debilitating symptoms, including excessive daytime sleepiness, severe sleep inertia, prolonged nighttime sleep, long and unrefreshing naps, and cognitive dysfunction. Limited research has investigated the clinical burden associated with IH. This study compared the clinical profile of patients diagnosed with IH versus matched non-IH controls.

Methods: MarketScan® administrative claims were analyzed between December 2013 and February 2020. Eligible patients were aged ≥18 years upon cohort entry and had 365 days of continuous medical coverage (gaps ≤30 days allowed) before and after cohort entry. IH cases entered the cohort upon the first medical claim containing an IH diagnosis and without history of cataplexy. Non-IH controls were matched 5:1 to patients with IH on age, sex, region, payer type, and cohort entry date. Prevalence estimates of Clinical Classification System Multilevel (CCSM) categories and comorbid conditions during the 2-year study period were compared between cohorts using logistic regression. Odds ratios (ORs) and 95% confidence intervals (CIs) were reported.

Results: The final cohorts included 11,428 and 57,138 patients with IH and non-IH controls, respectively. Approximately two-thirds of the sample was female (65.0%); median age was 45 years. Compared with non-IH controls, patients with IH experienced significantly higher prevalence of all CCSM categories. Prevalence estimates of conditions associated with sleep disorders, such as sleep apnea (OR: 26.1 [CI: 24.8, 27.6]), mood disorders (OR: 3.7 [CI: 3.6, 3.9]), and headache/migraine (OR: 2.9 [CI: 2.7, 3.0]), were higher among patients with IH. Similarly, cardiovascular conditions, including cardiovascular disease (OR: 2.2 [CI: 2.1, 2.4]), stroke (OR: 2.2 [CI: 2.0, 2.4]), major adverse cardiovascular events (OR: 2.2 [CI: 2.0, 2.4]), a composite of hypertension diagnosis or use of antihypertensive medications (OR: 2.0 [CI: 2.0, 2.1]), and heart failure (OR: 2.0 [CI: 1.8, 2.3]), were significantly more prevalent among patients with IH.

Conclusion: Patients with IH experience a significant burden of psychiatric and medical comorbidities, including acute and chronic cardiovascular illnesses. This is consistent with observations in other sleep disorders, namely, narcolepsy. Holistic treatment strategies for IH patients are needed, requiring careful consideration of patients' overall clinical profile when selecting therapies.

Support (if any): Jazz Pharmaceuticals.

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0848**TOTAL SLEEP TIME, WAKE AFTER SLEEP ONSET, AND INFLAMMATION PREDICT OBESITY IN YOUNG ADULT AFRICAN AMERICANS**Kevin Boyd¹, Kimberly Bell², Yuanxui Chen¹, Thomas Mellman¹¹ Howard University, ² North Carolina A&T

Introduction: Sleep is vital to maintaining psychological and physiological health. Poor sleep is associated with adverse health outcomes, including obesity. Studies have shown that African Americans disproportionately suffer from poor sleep and the adverse health outcome associated with obesity. We aimed to determine if sleep quality and peripheral inflammation are significant predictors of obesity in a young adult African American sample.

Methods: Participants were healthy adults with a body mass index of less than 40 between 18–35 who self-identified as Black or African American and completed a protocol consisting of in-lab polysomnography, ambulatory monitoring and a morning blood draw. Height and weight were collected to derive body mass index (BMI). Total sleep time (TST), wake after sleep onset (WASO), sleep onset latency (SOL), and sleep efficiency (SE) were derived from in-home actigraphy. Venipuncture was used to collect blood samples within 15 minutes of awakening. Once samples were processed, interleukin-6 (IL-6) levels were detected and quantified using enzyme-linked immunosorbent assays (ELISA).

Results: Significant correlations were found between BMI, WASO, TST, SE, and IL-6. A forward stepwise linear regression was used to identify possible predictors of BMI out of the following candidate variables: TST, SE, WASO, and IL-6. At each step, variables were chosen according to their contribution to the model's R^2 . The p-value threshold of 0.05 was used to set a limit on the total number of variables included in the final model. TST, WASO, and IL-6 were the significant predictors in the final model that accounted for 26% of the variance in BMI ($\Delta R^2 = .260$, $p < .001$). Regression coefficients suggest that IL-6 ($\beta = .388$), TST ($\beta = -.234$), and WASO ($\beta = .205$) predict obesity.

Conclusion: Total sleep time and wake after sleep onset are modifiable protective and risk factors that appear to be significant contributors to obesity in urban-residing young African Americans.

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0849

A CROSS-SECTIONAL SURVEY OF CANNABIS AS A SLEEP AID IN CANADIAN CANCER SURVIVORS

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Introduction: Cannabis is increasingly used to manage cancer treatment-related symptoms. This study investigated the use and perceived effects of cannabis as a sleep aid in Canadian cancer survivors.

Methods: Canadian cancer survivors (N=1492) completed a self-report questionnaire about their use of cannabis as a sleep aid.

Results: Of participants, 24% (n=356) reported currently using cannabis as a sleep aid (Mage = 61; 88% white, 78% in remission). Two thirds (67%; n=238) report only starting to use cannabis for sleep after their cancer diagnosis. Reported benefits include that cannabis helps them relax (59%) and fall asleep faster (48%). Half of participants (49%) use cannabis for sleep over 4–6 times a week, meeting the criteria for regular cannabis use and 53% have been using cannabis as a sleep aid for more than 2 years. Cannabis is most commonly used in the form of edibles (58%) and oils/ sprays (45%). Only 19% have authorization from a healthcare provider and 56% obtain their cannabis from a government regulated site. There was a mix of cannabinoid content in the products used, including products that contain mostly CBD (22%), mostly THC (35%), balanced amounts

of CBD and THC (32%), and 8% do not know the formulation of the cannabis they consume. The most common reasons for trying cannabis for sleep were a recommendation from family/friends (43%), their own research (35%), and that they believed it to be more natural than medication (31%). Of those who use cannabis for sleep, 31% also use it to reduce pain and 23% use it recreationally.

Conclusion: Estimates suggest that one in four Canadian cancer survivors regularly use cannabis to improve their sleep. Given the prevalence and potential impact, more research is needed to examine the actual efficacy of cannabis as a sleep aid.

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0850

ASSOCIATION OF ACTIGRAPHY-ASSESSED SLEEP PARAMETERS AND PHYSICAL FUNCTIONING FOLLOWING ACUTE HOSPITALIZATION IN OLDER ADULTS

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Introduction: Three out of 10 older adults are admitted for acute care in U.S. hospitals where they are at risk for a rapid decline in physical function due to deconditioning. Identifying factors, such as sleep continuity, that may be related to recovery of physical functioning is a key step in facilitating independence following hospital discharge. Thus, this study aimed to examine the association between actigraphy-assessed sleep parameters and physical functioning after an acute hospitalization in community dwelling older adults.

Methods: Participants (n=24; age 68.9±5.5y, 71% female, 96% white), were recruited during an acute hospitalization. Participants completed physical performance testing using the Short Physical Performance Battery (SPPB) during acute hospitalization (baseline) and at 4-weeks post-discharge (follow-up). At the time of discharge, participants were given Philips Actiwatch-2® device to record sleep continuity for four weeks following hospital discharge. Actigraphy parameters included total sleep time (TST), sleep efficiency (SE), sleep onset latency (SOL) and wake after sleep onset (WASO). We conducted multivariate regression

analyses using Poisson distribution to determine whether actigraphy-derived sleep parameters predicted of physical function.

Results: Increase in actigraphy-derived SE was associated with greater SPPB Balance (0.05 ± 0.02 , $p=0.04$) at the 4-week follow-up assessment. Increased TST was associated with improvements in SPPB total score (0.004 ± 0.002 , $p=0.05$) change score from baseline to 4-week follow-up. SE (0.11 ± 0.04 , $p=0.01$) and TST (0.004 ± 0.002 , $p=0.005$) were positively associated, whereas WASO (0.03 ± 0.01 , $p=0.05$) and SOL (0.15 ± 0.07 , $p=0.03$) were inversely associated with improvement in SPPB Balance change score from baseline to 4-week follow-up.

Conclusion: Together, these results demonstrated that improvements in actigraphy-derived sleep parameters (increased sleep efficiency and total sleep time; and decreased wake after sleep onset and sleep onset latency) were associated with improvements in physical functioning from hospital to 4-week follow up. Improving sleep during hospitalization may reduce hospital deconditioning and improve functional recovery.

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0851

EVALUATION OF A NEW SLEEP FOCUSED NASAL OBSTRUCTION SYMPTOM EVALUATION (NOSE) TOOL

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Introduction: Nasal obstruction is a common patient complaint in the sleep clinic. The nasal obstruction symptom evaluation (NOSE) scale is a validated questionnaire to assess symptoms and quality of life. However, it has weaknesses when evaluating patients in the sleep clinic because it does not differentiate awake and sleep related nasal obstruction. Our primary goal was to compare the old NOSE scale to a new sleep NOSE scale that separates awake and sleep related nasal obstruction.

Methods: A retrospective study was completed to compare the known NOSE scale (old NOSE) with a revised clinical scale more relevant to the sleep clinic (new sleep NOSE and new awake NOSE). 169 adult participants completed the 3 scales in a sleep clinic specializing in otolaryngologic interventions. The collected data compared median scores (Wilcoxon's signed rank test), agreement (Cohen's kappa), and correlation (Spearman correlation). Wald's test was also used to compare the scores between subgroups of insomnia and obstructive sleep apnea (OSA).

Results: The old NOSE scale scores were not significantly different from the sleep NOSE score ($p=0.4$) but was significantly different from the awake NOSE scale ($p<0.001$). The new sleep NOSE scores were also significantly higher than then awake NOSE scores ($p<0.001$). Patients with insomnia tended to score higher on the sleep NOSE scale than the awake NOSE scale.

Conclusion: This study suggests that in the sleep clinic setting, patients score the NOSE scale according to sleep related obstruction. In addition, insomnia patients relate more nighttime than daytime nasal obstruction. Further studies are needed to determine if the NOSE scale needs to be revised to better encompass nasal complaints related to sleep.

Support (if any):

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0852

INSOMNIA WITH OBJECTIVE, BUT NOT SUBJECTIVE, SHORT SLEEP DURATION IS ASSOCIATED WITH INCREASED RISK OF INCIDENT HYPERTENSION

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Introduction: Insomnia with objective short sleep duration (ISSD) has been associated with higher risk of cardiometabolic morbidity. In this study, we examined the association between ISSD, also based on subjective sleep duration, with incident hypertension in the Sleep Heart Health Study (SHHS).

Methods: We analyzed data from 1413 participants free of hypertension or sleep apnea at baseline from the SHHS with a median follow-up duration of 5.1 years. Insomnia symptoms were defined based on difficulty falling asleep, difficulty returning to sleep, early morning awakening, or sleeping pill use more than half days in a month. Objective short sleep duration was defined as polysomnography-measured total sleep time < 6 hours. Incident hypertension was defined based on blood pressure measures and/or use of antihypertensive medications at follow-up.

Results: Insomnia subjects who slept objectively < 6 hours had significantly higher odds of incident hypertension compared to normal sleeping subjects who slept ≥ 6 hours (OR=2.00, 95% CI=1.09-3.65) or < 6 hours (OR=2.00, 95%CI=1.06-3.79) or insomnia subjects who slept ≥ 6 hours (OR=2.79, 95%CI=1.24-6.30). Insomnia subjects who slept ≥ 6 hours or normal sleepers who slept < 6 hours were not associated with increased risk of incident hypertension compared to normal sleepers who slept ≥ 6 hours. Finally, insomnia subjects who self-reported sleeping < 6 hours were not associated with significantly increased odds of incident hypertension.

Conclusion: These data further support that the ISSD phenotype based on objective, but not subjective measures is, similar to sleep apnea.

Support (if any): The Sleep Heart Health Study (SHHS) was supported by National Heart, Lung, and Blood Institute cooperative agreements U01HL53916 (University of California, Davis), U01HL53931 (New York University), U01HL53934 (University of Minnesota), U01HL53937 and U01HL64360 (Johns Hopkins University), U01HL53938 (University of Arizona), U01HL53940 (University of Washington), U01HL53941 (Boston University), and U01HL63463 (Case Western Reserve University). The National Sleep Research Resource was supported by the National Heart, Lung, and Blood Institute (R24 HL114473, 75N92019R002).

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0853**NEIGHBORHOOD DISORDER AND PAIN: THE MEDIATING ROLE OF SLEEP**

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Introduction: Neighborhood factors are related to poor sleep, and sleep problems are known to have a strong relationship with pain. The underlying mechanisms for this association remain unclear. The present study evaluated whether sleep duration, sleep quality, or global sleep quality mediated the relation between perceived Neighborhood Disorder (ND) and pain intensity or interference. The study also explored whether adjusting for depressive symptoms accounted for significant mediational pathways found in Aim 1.

Methods: Participants were drawn from Wave 4 (September 2013 to September 2017) of the Healthy Aging in Neighborhoods of Diversity Across the Life Span (HANDLS) epidemiologic cohort study (n=1,071). Perceived ND was measured using the HANDLS Neighborhood Problems Scale, which assesses how often a particular neighborhood problem occurs. The Patient Reported Outcomes Measurement Information System Pain Intensity short form 3a was used to assess how much a person hurt in the past 7 days, and pain interference was measured by the bodily pain subdomain of the 12-item Short-Form Health Survey. The Pittsburgh Sleep Quality Index was used to assess sleep duration, subjective sleep quality, and global sleep quality.

Results: Results of the study revealed mediating effects of global sleep quality on the relation of perceived ND and pain intensity (indirect effect = .5527, SE = .1355, 95% CI [.2914, .8316]) and pain interference (indirect effect = .0579 (SE = .0143), 95% CI [.0312, .0876]) and also of subjective sleep quality on pain intensity (indirect effect = .5801, SE = .1337, 95% CI [.3206, .8468]) and pain interference (indirect effect = .0587 (SE = .0137), 95% CI [.0327, .0867]). Results revealed that mediating effects of sleep quality and global sleep on the relation of perceived ND and pain intensity and pain interference remained significant after adjustment for depressive symptoms.

Conclusion: These findings provide preliminary evidence to support the notion that select sleep dimensions, particularly sleep quality, is a pathway by which subjective neighborhood factors may impact pain intensity and pain interference. More research is needed to understand potential pathways underlying the perceived ND and pain relation.

Support (if any): NIH Intramural Research Program Inter-laboratory proposal provided by the National Institute on Aging Intramural Research Program

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0854**OBSERVATION-BASED DIURNAL SLEEPINESS INVENTORY (ODSI) IS ASSOCIATED WITH OBJECTIVE SLEEPINESS VIA PSYCHOMOTOR VIGILANCE TASK**

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Introduction: The Epworth Sleepiness Scale (ESS) is commonly used to assess excessive daytime sleepiness, but its accuracy is limited. In this study, we aim to compare the ESS with the Observation-based Diurnal Sleepiness Inventory (ODSI), a subjective measure of sleepiness that has been validated using the ESS in older adults, to objective measures of sleepiness obtained through the Psychomotor Vigilance Task (PVT). Despite being validated with the ESS, the ODSI has not yet been tested with objective measures of sleepiness. By comparing subjective measures of sleepiness (ODSI and ESS) to objective measures (PVT), we aim to expand the usage of ODSI to other populations.

Methods: 91 persons with newly diagnosed obstructive sleep apnea and not yet treated on continuous positive airway pressure (CPAP) were administered the ESS, ODSI, and PVT sleepiness tests, and the results were analyzed for correlations using linear regression. The average age was 50.48 ± 12.74 , the mean body mass index (BMI) was 35.9 ± 9.3 , the mean apnea hypopnea index was 30.9 ± 23.7 , and 53.5% were male. The ESS and ODSI scores were run against PVT lapses and transformed average reaction time, which are the two primary outcomes of PVT.

Results: PVT lapses were significantly different between sleepy and non-sleepy individuals as defined by both ESS and ODSI categorization. Both the ODSI and the ESS were significantly correlated to the transformed average reaction time. The second question on the ODSI was also significantly correlated to PVT lapses as well as the transformed average reaction time.

Conclusion: The ODSI and ESS correlated well with objective measures of sleepiness through the PVT. The ODSI is a suitable measure of sleepiness appropriate for usage in middle-aged adults with obstructive sleep apnea.

Support (if any): R00NR014675-05 (PI: Pak)

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0855**PATIENT-REPORTED SLEEP SYMPTOMS ACROSS FOUR CYCLES OF CHEMOTHERAPY AMONG ADULTS WITH LYMPHOMA: A PILOT STUDY**

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Introduction: Sleep disturbance is one of the primary symptoms reported by cancer survivors before, during, and after treatment. To better understand trajectories of sleep disturbance over the course of chemotherapy, we evaluated patient-reported symptoms among adults being treated for lymphoma.

Methods: Participants were 18-74 years old, English-speaking, and scheduled to be treated with a full course of anthracycline-based chemotherapy. Among other assessments, participants completed a battery of patient-reported outcome measures prior to the first cycle of chemotherapy (T1) and on the final days of the second (T2) and fourth (T3) cycles. Sleep symptoms were assessed with the Insomnia Severity Index (ISI), PROMIS Sleep Disturbance (PROMIS-SD), and PROMIS Sleep-Related Impairment (PROMIS-SRI) measures. Given the small sample size, descriptives and effect sizes were calculated rather than conducting inferential analyses.

Results: Participants were 9 adults with Hodgkin's (n=5) or Non-Hodgkin's (n=4) lymphoma, mean age 41 years (SD=13.9), mostly male (89%), White (78%), and non-Hispanic (89%). The majority had higher scores on the ISI (85.7%), PROMIS-SD (71.4%), and PROMIS-SRI (71.4%) at T2 than T1, demonstrating more sleep disturbance mid-chemotherapy than prior to chemotherapy. Conversely, the majority had lower scores at T3 than T2 (ISI: 80.0%, PROMIS-SD: 80.0%, PROMIS-SRI: 100.0%), demonstrating less sleep disturbance at late-chemotherapy than mid-chemotherapy. For most participants scores remained higher at T3 than T1 (all 3 measures: 75.0%), indicating more sleep disturbance at late-chemotherapy than pre-chemotherapy. Averaged across participants, differences in scores from T1 to T2 were small-to-medium (ISI: Hedges' $g=0.42$, PROMIS-SD: $g=0.44$, PROMIS-SRI: $g=0.62$), from T1 to T3 were small (ISI: $g=0.26$, PROMIS-SD: $g=0.26$, PROMIS-SRI: $g=0.23$), and from T2 to T3 were medium-to-large (ISI: $g=0.98$, PROMIS-SD: $g=0.73$, PROMIS-SRI: $g=0.53$).

Conclusion: Patient-reported sleep symptoms worsened over the first two cycles of anthracycline-based chemotherapy. Symptoms improved over the subsequent two cycles; however, for most participants they remained worse than baseline levels. Pending replication in a larger sample, intervening before initiating chemotherapy or during the early cycles thereof may be beneficial to diminish sleep disturbance among patients with lymphoma.

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0856**ARE AFRICAN-AMERICANS/BLACKS WITH ASTHMA GETTING THE RECOMMENDED AMOUNT OF SLEEP?**

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Introduction: Asthma is one of the leading respiratory illnesses in the United States. African Americans/Blacks are particularly vulnerable to the long-term effects of this condition. In addition to general healthcare inequities, African Americans/Blacks may also have an increased vulnerability to the deleterious effects asthma may enact on health behaviors such as sleep. Comparison between races for how much asthma affects sleep health would be useful to address these vulnerabilities.

Methods: Analysis was performed on the 2020 National Health Interview Survey, the most recently collected data (n=31,568.) The sample was stratified to include only asthmatics using the survey variable that asked "Have you ever been diagnosed with asthma?" 8.6% of the sample reported having asthma (n=2123). Adjusted binary logistic regression was performed to determine how race predicts sleep health in this population. Covariates included age, sex, education, household income, and physical activity. "Healthy Sleep" was coded as self-reported 7-8 hours of sleep, and "Unhealthy Sleep" was coded as either less than 6 hours or more than 9 hours, as literature establishes short and long sleep have deleterious effects on health. "Race" was coded as White, Black, American Indian/Alaskan, or Asian. In the regression, White was used as the reference category.

Results: In the adjusted model for race predicting healthy sleep, only African-Americans/Blacks showed significance compared to other races. The model showed that Blacks who are asthmatic are 54% ($p<.01$) less likely to sleep for 7-8 hours per day. Asian asthmatics ($p=.815$), and American Indian asthmatics ($p=.761$) did not demonstrate significance in the model predicting healthy sleep.

Conclusion: These analyses show a pronounced connection between black racial status and unhealthy sleep amongst asthmatics. The results are in line with literature that demonstrates blacks sleep less in general and are more commonly afflicted with sleep conditions such as OSA, but there is a dearth of research examining how asthma affects sleep in this population. Further studies are needed to examine the underlying factors that may drive these vulnerabilities.

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0857

ASSOCIATIONS BETWEEN FUNCTIONAL VISION AND SLEEP PERFORMANCE

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Introduction: Conserved early visual pathways set visual perception and sleep consolidation and timing, but the associations between functional vision and sleep are not well established. Here, we determine these associations in a nationally-recruited adult cohort and contrast them with health outcome covariates.

Methods: Data were drawn from 5973 adults aged 20 to 85 years ($M=41.32$, $SD=21.82$), obtained from the US National Health and Nutrition Examination Survey (NHANES) 2005-2006 and 2007-2008 cohorts. Adults reported demographics, sleep duration, vision, body size (body mass index; BMI), depression (Patient Health Questionnaire-9), and social support information. Spearman's rank correlations were performed to determine the association between self-reported measures of functional vision and self-reported typical nightly sleep duration. To determine the influence of covariates thought to moderate health outcomes on this association, ordinal logistic regression was performed with sleep as the predictor and 'general eyesight condition' or 'vision limiting activities' as the dependent variables; and age, BMI, depression, and emotional support as covariates.

Results: Typical nightly sleep duration correlated very weakly with general eyesight condition ($r=-.07$, $p<.001$), vision limiting activities ($r=-.03$, $p=.001$), eyesight worry ($r=-.09$, $p<.001$), difficulty reading newsprint ($r=-.06$, $p<.001$), and difficulty discriminating objects ($r=-.03$, $p=.007$). For general eyesight condition, (exponentiated) odds ratios were minorly improved with increasing typical nightly sleep duration ($B=.93$, $p<.001$), but these effects were eclipsed by psychosocial factors such as PHQ-9 depression score ($B=1.11$, $p<.001$) and emotional support availability ($B=.71$, $p<.001$), while ageing had a minor effect ($B=1.02$, $p<.001$) and BMI did not associate ($p=.29$). For vision limiting activities; odds ratios were not influenced by typical nightly sleep duration ($p=.086$), psychosocial factors such as PHQ-9 depression score ($B=1.13$, $p<.001$) and emotional support availability ($B=0.63$, $p<.001$) meaningfully enhanced odds ratios, while ageing ($B=1.03$, $p<.001$) and BMI had minor effects ($B=1.01$, $p=.009$).

Conclusion: Despite shared sensory pathways, the neuroprotective effects of sleep on functional vision appear limited. Unlike for many disorders, BMI and ageing did not meaningfully associate with functional vision deficits. Psychosocial support mechanisms had the strongest beneficial association with functional vision, and such mechanisms should be given more consideration during optometric care.

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0858

ASSOCIATIONS BETWEEN SLEEP DURATION AND CHOLESTEROL LEVELS AMONG HISPANICS: FINDINGS FROM THE NATIONAL HEALTH INTERVIEW SURVEY

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Introduction: Short sleep (< 7 hours of sleep/24 hr. period) duration is associated with unhealthy cholesterol levels, a significant cardiovascular risk marker. Precious epidemiological studies indicate that Hispanics are at increased risk for hypercholesterolemia. However, little is known about whether sleep duration contributes to high cholesterol levels, among Hispanics. We sought to investigate the following: 1) Examine whether sleep duration predicts cholesterol levels; 2) Examine whether this relationship differs in Hispanics in comparison to non-Hispanics.

Methods: This study was based on the 2020 National Health Interview Survey. Cholesterol, the outcome, is defined as whether an individual had high cholesterol during the last 12 months. Sleep quantity was categorized as follows: short sleep (< 7 hours), healthy sleep (7-8 hours), and long sleep (≥ 9 hours). For stratified analyses, we investigated whether the relationship between sleep duration and cholesterol differed between Hispanics and non-Hispanics. We performed unadjusted and fully adjusted binary logistic regression analyses, with age, sex, education, income, and BMI as covariates.

Results: In our unadjusted models, Hispanic short sleepers had increased odds of high cholesterol (OR: 1.39 $p<.01$), while long sleepers (OR: 1.25, n.s. $p=.129$) did not, compared to individuals who slept 7-8 hours. Non-Hispanic short (OR: 1.14 $p<.01$) and long (OR: 1.47, $p<.01$) sleepers had greater odds of high cholesterol, compared to individuals who slept 7-8 hours. For our fully adjusted models, Hispanic short sleepers had increased odds of high cholesterol (OR: 1.29, $p<.05$), while long sleepers did not (OR: 1.15, n.s. $p=.55$), compared to individuals who slept 7-8 hours. Non-Hispanics short sleepers had greater odds of high cholesterol (OR: 1.13 $p<.01$), while among long sleepers, no significant relationship was observed (OR: 1.05, $p=.46$), compared to individuals who slept 7-8 hours. Overall, Hispanic short sleepers had greater odds of high cholesterol compared to their non-Hispanic counterparts.

Conclusion: Hispanic short sleepers have an increased risk for high cholesterol. Further studies are needed to elucidate the pathophysiological mechanisms that affect the relationship between short sleep and cholesterol levels among Hispanics. This will enable tailored risk and protective profiling of Hispanic individuals to reduce their risk for high cholesterol.

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0859**CHARACTERIZING COMORBID CHRONIC PAIN IN VETERANS WITH OBSTRUCTIVE SLEEP APNEA**Bruno Saconi¹, Rosemary Polomano², Peggy Compton²,
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Introduction: Evidence suggests that chronic noncancer pain (CP) and obstructive sleep apnea (OSA) are highly prevalent in the adult civilian population. As military veterans are disproportionately affected by both CP and OSA, greater understanding of the frequency and characteristics of CP that most commonly affect veterans with OSA is needed. Thus, this study characterized CP among veterans with OSA in terms of frequency, location, duration, severity, interference on daily activities, and etiology (neuropathic versus not).

Methods: A descriptive, observational, cross-sectional survey of veterans with newly diagnosed, untreated OSA and reporting pre-existing CP (N=107). Descriptive statistics characterized the sample and comorbid CP outcomes.

Results: In total, 69.5% (107/154) of participants with OSA who consented for the study had CP. Among participants with CP completing the survey (66.4% [71/107]), CP symptoms persisted for 15 years (IQR = 10-26.5). On average, Brief Pain Inventory – Short Form scores (0-10 scale) indicate moderate pain severity (5.2 ± 2.0) and interference on daily activities (5.7 ± 2.3). Greater pain interference was with sleep (6.3 ± 3.1) and enjoyment of life (6.0 ± 2.5). Pain affected multiple body regions and symptoms of predominantly neuropathic origin (defined as Self-completed Leeds Assessment of Neuropathic Symptoms and Signs scores ≥ 12) were reported by 49.3% of the sample.

Conclusion: CP is commonly comorbid with OSA. Primary care, pain management, and sleep medicine providers should prioritize CP screening, OSA screening, and management among patients with OSA. Future investigations of CP and OSA should focus on their association and how the effective treatment of one affects the severity of the other.

Support (if any): SRSF Small Research Grant Award: 05-SRG-20. University of Pennsylvania School of Nursing, Office of Nursing Research.

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0860**COMPARATIVE DESCRIPTION OF SLEEP, THYROID-STIMULATING HORMONE AND CALCIUM METABOLISM IN 5 VITILIGO PATIENTS UNDER PHOTOTHERAPY**Ellen Xerfan¹, Anamaria Facina², Jane Tomimori³, Sergio Tufik²,
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Introduction: Vitiligo is an autoimmune skin disease represented by melanocytes destruction. Clinically, it evolves with spots that are lighter than normal skin color. Periodical evaluation of patients is recommended, including thyroid function. Phototherapy is its gold standard treatment, consisting in specific range of ultraviolet B (UVB) light sections. Sleep may play an immunological role, and should be investigated in vitiligo. The study aimed to compare results of thyroid-stimulating

hormone (TSH), parathyroid hormone (PTH), serum calcium and vitamin D 1.25(OH)2D and 25(OH)D; and Pittsburgh Sleep Quality Index (PSQI) scores of vitiligo patients before and after phototherapy period.

Methods: Five individuals with vitiligo were evaluated at a University Dermatology Service, following ethical guidelines. Blood collection and PSQI application were performed before and after phototherapy. Laboratory elements were those related to calcium metabolism (PTH, calcium and vitamin D) and TSH.

Results: The sample included 4 female individuals with 21, 46, 65 and 70 years old; and a 57 years old male. Three of them had large skin involvement and 2 had localized vitiligo. After 6 months under phototherapy, patients returned for reassessment. All showed skin lesions improvement. Quantitative increase in TSH, PTH, 1.25(OH)2D and 25(OH)D was observed; serum calcium varied among the sample. Regarding PSQI before phototherapy, all 5 scores were >5 (1 score >10). The PSQI was reapplied only in 3 of the 5 volunteers after phototherapy; 2 scores reduced, and 1 score increased. This results, although from few individuals, alert to the possible role of UVB phototherapy on TSH and calcium metabolism substrates. Vitamin D increase may be associated to improvement of subjective sleep of 2 individuals. It was described that vitamin D in sufficient concentration could be related to better sleep quality. Phototherapy, by acting on clinical improvement of vitiligo, may influence subjective sleep, as reported in PSQI; and it could influence on melatonin and circadian rhythm.

Conclusion: The interaction between vitiligo/autoimmunity, phototherapy, vitamin D and sleep is complex and may have interrelated pathways. A better understanding of this pathophysiology through larger studies is worthy for benefiting clinical management of vitiligo and associated sleep disorders.

Support (if any): AFIP, CAPES and CNPq.

Abstract citation ID: zsad077.0861

0861**DOES COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA REDUCE PRODUCTIVITY LOSS IN CANCER SURVIVORS WITH COGNITIVE IMPAIRMENT?**Joshua Tulk¹, Sondria Browne², Harsha Ajith¹, Sheila Garland¹¹ Memorial University, ² Person with Lived Experience

Introduction: Insomnia and perceived cognitive impairments (PCI) affect 1 in 4 cancer survivors and negatively affects work productivity. This study explores the impact of cognitive behavioral therapy for insomnia (CBT-I) on work presenteeism and absenteeism in cancer survivors with comorbid insomnia and PCI.

Methods: A sub-sample of 42 Atlantic Canadian survivors with insomnia disorder and PCI who were currently working for pay were analyzed as part of a larger randomized clinical trial. Participants completed 7 virtual sessions of CBT-I. The Work Productivity and Activity Impairment Index Specific Health Problem Questionnaire (WPAI: SHP) was administered pre-and post-treatment. Absenteeism was defined as the percentage of time absent from work, while presenteeism was defined as the extent to which health problems affected productivity at work in the past 7 days. Costs were calculated by the human capital method. Significant changes in productivity loss were defined at $\geq 15\%$ or 20% change in absenteeism and presenteeism, respectively. Descriptive statistics and paired samples t-tests were used to measure changes in productivity following treatment. Average

net benefit was calculated by subtracting the average treatment cost from average treatment benefits after 1 year to reflect cost savings after CBT-I. The cost of treatment was estimated in terms of average cost per session and lost time at work.

Results: Participants (76% Female) were, on average, 50.4 years old with 16.6 years of education. Breast cancer was the most reported cancer type (43%). Overall rates of presenteeism were significantly lower at post-treatment ($p < .001$, $d = 0.55$), with 52.4% reporting significant reductions. Absenteeism rates from pre- to post-treatment were not significant ($p = .11$, $d = 0.20$). Reduced productivity loss post-treatment was associated with an average savings of CAD\$10,979/person/year. Average net benefits for the first-year post-treatment equaled CAD\$9348/person.

Conclusion: CBT-I can improve work productivity in cancer survivors. Investments to increase and provide access to evidence-based treatment may lead to significant savings for individuals and businesses.

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0862

EFFECT OF MEDITATION AND RELAXATION ON PHYSIOLOGICAL MARKERS OF STRESS AND SLEEP

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Introduction: Both breathing based meditation (interoceptive) and relaxation by improving blood circulation using heat and massage (exteroceptive) are known to reduce physiological stress. In this study, we determined the effect of stress-reduction on sleep. Our main population of interest was peri- and post-menopausal women who may develop sleep disorders correlated with early-life physical abuse.

Methods: 20 adults (15 peri- and post-menopausal females), 13 with high risk of sleep apnea (determined by Berlin questionnaire, age mean $\pm$ SEM, 54 ± 3 years, waist-by-neck 2.6 ± 0.07 , BMI 26 ± 1 kg/m², Insomnia Severity Index (ISI) Scale 5.71 ± 1.23 , Generalized Anxiety (GAD-7) Score 5.33 ± 1.22 , Early Trauma Inventory Self-Report Short Form (ETISR-SF) physical 3 ± 0.17 . Dreem3 headband was used to get breathing rate (BR), sleep efficiency, sleep staging. Plethysmography was used to obtain mean and nadir oxygen saturation %, heart rate (HR), oxygen desaturation (4%) event index (ODI). BMI, age, waist/neck were recorded. Baseline sleep measures were compared against sleep after administration of 10 minutes rest, 10 minutes relaxation and 10 minutes of Ujjayi pranayama with repeats of 4 in-, 4 hold-, 6 out-breaths. ETISR-physical was correlated with all measures. Paired t-tests were conducted on sleep measures at baseline and after meditation/relaxation. One-sample t-tests were conducted on average % changes during meditation/relaxation compared to rest.

Results: Early-life physical trauma correlated positively with BR during REM sleep (Pearson $R = 0.68$). Deep sleep significantly ($p = 0.04$) increased by 5% on the sleep after meditation/relaxation. Both meditation and relaxation techniques significantly ($p < 0.01$) lowered HR by 1.5% and 4.5%, and BR by 20% and 15% respectively during Ujjayi pranayama and relaxation. We observed significant increase ($p < 0.05$) in oxygen saturation with the Ujjayi pranayama by 0.3%.

Conclusion: Early-life physical abuse was correlated with faster breathing during REM sleep validating existing literature. Both HR and BR were reduced during meditation and relaxation techniques, thus validating their stress-reduction effects. % of deep sleep improved on the night when meditation/relaxation session was administered. Mind-body practices could improve deep sleep if practiced regularly even in peri- and post-menopausal women having early-life physical abuse trauma.

Support (if any): Sleep Research Society (SRS) Small Research Grant 2022.

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0863

EVALUATION OF SLEEP APNEA AMONG CONSECUTIVE PATIENTS WITH ALL PATTERNS OF ATRIAL FIBRILLATION

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Introduction: Atrial fibrillation (AF) is the most common arrhythmia encountered in clinical practice and is associated with significant morbidity, mortality, and financial burden. Obstructive sleep apnea is more common in individuals with AF and may impair AF treatment efficacy including with catheter ablation. However, the prevalence of undiagnosed OSA in all-comers with AF is unknown.

Methods: This pragmatic, phase IV prospective cohort study will test 250-300 consecutive ambulatory AF patients with all patterns of atrial fibrillation (paroxysmal, persistent, and long-term persistent) and no prior sleep testing for OSA using the WatchPAT system, a home sleep test.

Results: We report the design, methodology, and results from the initial pilot enrollment of approximately 25% ($N = 52$) of the planned sample size. The primary outcome is the prevalence of undiagnosed OSA in all-comers with AF. Additional outcomes of interest include the sensitivity and specificity of clinical screening instruments for OSA in the AF population and AF-related quality of life measurements among those with and without OSA. Results of the pilot dataset demonstrate a 77.5% prevalence of at least mild ($AHI \geq 5$) OSA or greater in all-comers with AF.

Conclusion: Based on our preliminary dataset representing one quarter of the planned total enrollment size of 250-300, there is a high prevalence of OSA in all-comers with AF.

Support (if any): Zoll Medical

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0864

EVOLUTION OF SLEEP SYMPTOMS OVER TIME AMONG YOUTH WITH CRANIOPHARYNGIOMA

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Introduction: Craniopharyngioma is a non-malignant tumor that arises in the suprasellar region of the intracranial compartment.

Hypothalamic dysfunction is common and associated with diabetes insipidus, hormone deficiencies, neurocognitive impairment, sleep disturbance, obesity, and decreased health-related quality of life. Patients with craniopharyngioma commonly have excessive daytime sleepiness, and are often diagnosed with narcolepsy without cataplexy and even obstructive sleep apnea (OSA). This study examined the change in apnea/hypopnea index (AHI) and prevalence of disorders of hypersomnia among pediatric patients with craniopharyngioma, from the time of diagnosis to 3 years after the completion of proton therapy.

Methods: A total of 110 pediatric patients diagnosed with craniopharyngioma were prospectively evaluated on a protocol of limited surgery and proton therapy or observation. Prior to proton therapy, patients age ≥ 4 years completed a baseline overnight polysomnography (PSG) and the next day multiple sleep latency test (MSLT) when age ≥ 7 years. Follow-up PSG and MSLT were repeated 3 years later. Patients were excluded from the analysis if they did not complete the sleep study at either time points.

Results: 71 completed the baseline and 3-year PSG/MSLT. A paired samples t-test determined the change between time points. When compared to baseline ($M=1.30$, $SE=.22$) the AHI significantly increased at the 3-year evaluation ($M=3.00$, $SE=.60$), with a difference of $t=-1.69$, ($p=.002$). Fifty-one patients completed the baseline and 3-year MSLT. At baseline, 8 patients did not exhibit a hypersomnolence disorder, 30 were diagnosed with hypersomnia due to medical disorder and 13 were diagnosed with narcolepsy due to medical disorder. At the 3-year MSLT, 2 of the 51 did not exhibit a hypersomnolence disorder, 30 were diagnosed with hypersomnia due to medical condition and 19 were diagnosed with narcolepsy due to medical condition.

Conclusion: Pediatric patients with craniopharyngioma have disorders of hypersomnolence at diagnosis. The number impacted by hypersomnia increase with time, with the added burden of hypothalamic obesity and OSA. Interventions should be initiated early after diagnosis for promotion of wakefulness and prevention of obesity to deter the onset of OSA.

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0865

FEASIBILITY OF A DISPOSABLE HOME SLEEP TEST DEVICE IN A CHRONIC PAIN POPULATION PRESCRIBED OPIOIDS

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Introduction: Opioids are a common pain treatment in the United States with approximately 143 million prescriptions dispensed in 2020. Long-term opioids for chronic pain increase risk of misuse and overdose. Opioids can also disrupt sleep and cause respiratory depression while poor sleep can exacerbate pain. In-lab polysomnography is the standard for diagnosing sleep disorders. However, polysomnography is less effective for observing patterns over multiple days and is not always representative of at-home sleep. This study investigates the feasibility of using a disposable home sleep test device with adults prescribed opioids for chronic pain and its ability to screen for sleep disorders and overnight oxygenation.

Methods: Participants were recruited from clinics and public advertisements. Key inclusion criteria were: ≥ 18 years of age, moderate daily level of pain (≥ 5 on the 0-10 Numeric Pain Scale [NPS]), prescribed opioids, and internet access. The NightOwl mini disposable home sleep test (Ectosence, Leuven, Belgium) was used to record total sleep time (TST), time in bed (TIB), sleep efficiency (SE), oxygen saturation (SaO₂) and apnea-hypopnea index (AHI) for 5 consecutive nights.

Results: All enrolled participants ($N=9$) completed 5 days with no missing data. The sample was 66% female with an average age of 60 ± 12 (Mean $\pm$ SD). Mean NPS scores indicated moderate pain intensity (6.3 ± 1.9). Participants spent an average of 8.0 ± 1.4 h TIB and slept for 5.4 ± 1.3 h TST resulting in a SE of $68.5 \pm 17.9\%$. On average, AHI was 7.3 ± 7.7 (mild range for sleep apnea). 56% of participants displayed a SaO₂ nadir below 88%, the recommended threshold for supplemental oxygen. All individuals agreed that they were at least somewhat satisfied with the ease and amount of time participating in the study. All agreed or strongly agreed that they felt comfortable participating.

Conclusion: Participants used the disposable sleep test device at home with relative ease as indicated by complete data recording, values within expected norms, and satisfaction survey responses. The device could be an acceptable screening tool for sleep disorders and respiratory events that may otherwise go undetected in this population prescribed opioids and at risk for apnea and respiratory depression.

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0866

GEOGRAPHIC INSUFFICIENT SLEEP DURATION AND CARDIOMETABOLIC RISK AMONG ADOLESCENTS AND ADULTS IN THE T1D EXCHANGE CLINIC REGISTRY

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Introduction: Individuals with type 1 diabetes (T1D) are at a heightened risk for cardiometabolic disease and associated risk factors. Insufficient sleep duration (< 7 hours) may accentuate this risk, but little is known about its geographic distribution. Insufficient sleep is disproportionately distributed across the United States. We sought to determine whether the geographic distribution of insufficient sleep was associated with individual cardiometabolic risk among 18,620 adolescents and adults ages 13-90 years in the T1D Exchange Clinic Registry.

Methods: We linked residence zip codes with prevalence of insufficient sleep generated from the Population Level Analysis and Community Estimates (PLACES) dataset. We examined associations between geographic patterns of sleep duration (area-level) and individual cardiometabolic risk factors (hemoglobin A1c, low-density lipoprotein, blood pressure, body mass index) using multivariable linear regression adjusting for age, sex at birth, T1D duration, and race/ethnicity.

Results: Geographic areas with shorter sleep duration experienced multiple individual cardiometabolic risk factors. Specifically, shorter geographic level sleep duration was associated with higher glycemia ($\beta = .156$, $p < .001$, $R^2 = .144$), higher body mass index ($\beta = .037$, $p < .001$, $R^2 = .125$), higher low density lipoprotein cholesterol ($\beta = .022$, $p < .001$, $R^2 = .031$), and higher systolic blood pressure ($\beta = .021$, $p < .001$, $R^2 = .142$), even after adjusting for covariates (age, sex, type 1 diabetes duration, and race/ethnicity). There were significant differences in age, race/ethnicity, and sex. The association between shorter area-level sleep duration and diastolic blood pressure was no longer significant after adjusting for covariates.

Conclusion: Adolescents and adults with T1D living in areas with a higher prevalence of insufficient sleep had higher cardiometabolic risk even after considering covariates. Future studies are warranted to unravel underlying mechanisms contributing to cardiometabolic risk at the individual level (e.g., sympathetic dysregulation, discrimination, insulin insensitivity, and inflammation) as well as other geographic contributions (e.g., air, light noise pollution, redlining). Understanding the determinants of geographic variability would enhance the utility of these data for public health campaigns.

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0867

LOWER BEDTIME HRV IS ASSOCIATED WITH HIGHER WASO IN MIDDLE-AGED ADULTS WITH CHRONIC INSOMNIA

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Introduction: Short sleepers (< 6 hours per night) represent a unique phenotype of insomnia associated with more severe biological implications compared to insomnia with normal sleep duration. A primary contributor to shorter sleep duration is more time spent awake after sleep onset (i.e., WASO), which has deleterious effects on long-term cardiac physiology. For instance, short sleepers with higher WASO have lower parasympathetic activity at sleep onset compared to those with lower WASO or greater sleep duration.

Methods: Results presented here are derived from baseline assessments collected as a part of a clinical trial comparing three modalities of cognitive behavioral therapy for insomnia in middle-aged adults (50-65yrs) with chronic insomnia (N = 23). During their baseline assessment, individuals first completed one night of in-home polysomnography. Total sleep time was PSG derived. The following night, they wore an Equivital Harness equipped with an electrocardiogram (ECG) for 24 hours. In this investigation, inter-beat intervals were derived from ECG in 10-minute segments just before and just after bedtime (i.e., when the individual tried to sleep). WASO was calculated using sleep diaries during the night they wore the Harness and the following week.

Results: Preliminary data (N = 23) show that high frequency (0.15-0.4Hz) heart rate variability (HRV; i.e., parasympathetic activity) at bedtime is not associated with WASO that night or WASO averaged across the following week. However, when the sample was narrowed to short sleepers only (≤ 6 hours; n = 7),

lower levels of bedtime HRV ($B = -.81$, $p = .028$) is associated with greater WASO during the following week. In short sleepers, mean score of both before and after bedtime HRV predicted 65% of variance in WASO averaged across the next seven nights ($R^2 = .653$, $F(1, 5) = 9.41$, $B = -.81$, $p = .28$). These effects were not significant in individuals with sleep durations longer than 6 hours.

Conclusion: In this small sample, short sleepers display a unique, inverse relationship between cardiac vagal activity and sleep continuity, replicating similar findings regarding parasympathetic activity at sleep onset and subsequent WASO.

Support (if any): This project is supported by the Psychology Department at the University of Arizona.

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0868

LOW-FIDELITY USABILITY TESTING OF A SMARTPHONE APP TO TREAT INSOMNIA IN CANCER SURVIVORS

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Introduction: Cancer patients and survivors experience insomnia at a higher rate than the general population. Mobile health (mHealth) applications have considerable promise for the treatment of insomnia, but have been criticized for not following evidence-based treatment guidelines. To make insomnia treatment more accessible for survivors, iCANSleep has been developed using user-centered design principles to administer Cognitive-Behavioral Therapy for Insomnia via a smartphone app. The current research presents insights from the low-fidelity usability testing phase of development.

Methods: Usability testing is an iterative process of testing an intervention's user-interface and then applying the results to redesign the prototype to meet users' needs. Eight cancer survivors from across Canada viewed a video demonstration of the app and completed semi-structured interviews about the app's design and content. All interviews took place through video conferencing software and were recorded. Researchers transcribed interview responses and analyzed them for common themes.

Results: Participants (71% Female; Mage: 53) were generally very impressed with the design and layout of the app. Most (75%) participants were very interested in trying the app and reported that they would complete the app's treatment program. Participants appreciated the integration of cancer-specific stories and material, the app's simple, user-friendly design, the use of incentives and reinforcements, and the depth and breadth of its content. Those interviewed commented on the comprehensive sleep diary within the app and its apparent simplicity. Suggestions were made to streamline the onboarding and replace animations with real people.

Conclusion: User-centered development of the app is promising. The app's patient-centeredness, accessibility, simplicity, and thoroughness were highlighted as strengths. The development team will integrate these results into the continued app development while working to make onboarding material more engaging. It is important to continue to engage patients throughout to ensure user engagement and effective care.

Support (if any): Samlau Kutana is a trainee in the Cancer Research Training Program of the Beatrice Hunter Cancer Research Institute, with funds provided by the Canadian Cancer Society's JD Irving, Limited – Excellence in Cancer

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0869

NON-ALCOHOLIC FATTY LIVER DISEASE IS ASSOCIATED WITH WORSE OUTCOMES IN ATRIAL FIBRILLATION PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Managing atrial fibrillation (AF) in patients with obstructive sleep apnea (OSA) is challenging and often associated with worse outcomes. Non-alcoholic fatty liver disease (NAFLD) is shown to be associated with increased cardiovascular morbidity and mortality. The effect of NAFLD on AF in patients with OSA is not well studied. This study aims to investigate this association in hospitalized patients.

Methods: We queried the National Inpatient Sample (NIS) between 2017-2020 for adult patients hospitalized for AF with history of OSA & had NAFLD. The primary outcome was in-hospital mortality. The secondary outcomes were cardiogenic shock, gastrointestinal bleeding (GIB), cardiac arrest, invasive mechanical ventilation (IMV) and length of stay (LOS). Multivariable logistic and Poisson regression analyses were used to estimate clinical outcomes. Outcomes were adjusted for age, gender, race, heart failure, diabetes, CKD, chronic respiratory failure, stroke and history of MI. P-value < 0.05 was statistically significant.

Results: We identified 1,843,865 hospitalizations for AF with history of OSA: NAFLD in 61,235 (3.4%). AF with OSA and NAFLD vs. no NAFLD had mean age 68.4 vs. 70.6, males 65.2% vs. 64.1%, white 78.2% vs. 80.2%, black 9.3% vs. 10.2%, obesity 45.7% vs. 46.5%, heart failure 69.2% vs. 59.6%, diabetes 59.2% vs. 51.1%, anemia 23.5% vs. 17.2%, CKD 52.4% vs. 40% and COPD 38.2% vs. 39.1%. In-hospital mortality was 11.4% in the NAFLD group vs. 2.5% in the non-NAFLD group (aOR 5.2, P< 0.001). NAFLD vs. non-NAFLD groups had GIB 9.4% vs. 4.5% (aOR 2.1, P< 0.001), cardiac arrest 3.4% vs. 0.9% (aOR 3.4, P< 0.001), cardiogenic shock 7% vs. 1.2% (aOR 4.9, P< 0.001), IMV 10.9% vs. 3.4% (aOR 3.3, P< 0.001) and LOS 7.7 vs. 5.6 (aIRR 1.27, P< 0.001).

Conclusion: Our study shows that NAFLD has worsened the outcomes of patients admitted with AF and has history of OSA. The fivefold increase in in-hospital mortality is likely related to the increase in in-hospital hemorrhagic events and cardiac arrest. Clinicians should be aware of this association. Further research is needed to mitigate the detrimental effect of liver disease on OSA and AF patients.

Support (if any):

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0870

NON-PHARMACOLOGICAL SLEEP INTERVENTIONS FOR PATIENTS AFTER CARDIAC SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: Patients who have undergone cardiac surgery experience decreased sleep quality, which is associated with patients' quality of life and mortality. Various interventions were conducted to improve sleep after cardiac surgery; however, findings have been inconsistent. This systematic review was conducted to examine the effects of non-pharmacological sleep interventions in patients after cardiac surgery.

Methods: The review was performed following PRISMA guidelines. CINAHL, PubMed, PsycINFO, Embase, Scopus, and Web of Science were searched. Studies were included if they were a randomized controlled trial that applied non-pharmacological sleep intervention in patients who underwent cardiac surgery and reported sleep as an outcome. Excluded studies conducted on non-open-heart surgery (e.g., percutaneous coronary intervention) or were theses, dissertations, reviews, or study protocols. Quality appraisal of included studies was assessed using the Cochrane Risk of Bias tool. Meta-analysis was conducted, and mean effect size was separately calculated for studies with reverse-scored scales, which means higher scores indicate poorer sleep quality.

Results: Twenty studies (n=1,460 participants) were included. The most common cardiac surgery was coronary artery bypass graft, and sleep was mostly measured using subjective questionnaires in the studies; only 1 study applied both subjective and objective measures (Actigraphy). Sleep interventions were conducted in a hospital intensive care unit, ward, or outpatient clinic between 1 month before and 2 months after the surgery. The interventions were categorized into educational strategies, complementary medicine relaxation methods, complementary medicine sensory therapies, and the use of a device (e.g., earplugs or eye masks). The meta-analysis results showed that non-pharmacological interventions resulted in better sleep quality as compared to control group. The mean effect size was 0.66 for studies with regular scoring scales (95% confidence interval [CI], 0.38 to 0.94) and -0.83 with reverse scoring scales (95% CI, -1.23 to -0.42), which indicated that the sleep interventions were overall effective for improving sleep quality with medium-to-large effect sizes.

Conclusion: Non-pharmacological sleep interventions improved sleep quality in patients after cardiac surgery. More studies should be conducted to identify the most effective type of sleep intervention and examine the long-term effects of these interventions using objective measures of sleep.

Support (if any):

Abstract citation ID: zsad077.0871

0871**OUTCOMES IN OVERLAP SYNDROME OF COPD AND OSA: A SECONDARY DATA ANALYSIS OF STAGES**Lindsey Clark¹, Brendan Keenan¹, Joanna Hart¹, Allan Pack¹, Amy Sawyer¹¹ University of Pennsylvania

Introduction: Chronic obstructive pulmonary disease (COPD) and obstructive sleep apnea (OSA) are highly prevalent, and termed Overlap Syndrome (OVS) when coexistent. Patient-reported outcomes (PROs) are impaired in both COPD and OSA alone, but their combined impact is unclear. We examined differences in the impact of COPD on PROs in adults with and without OSA.

Methods: Analyses included adults aged ≥ 8 years with polysomnographic (PSG) data from the Stanford Technology Analytics and Genomics in Sleep (STAGES) study. We created sets of individuals with and without COPD, matched up to 1:5 on age ± 5 years, BMI ± 2.5 kg/m², AHI ± 5 events/hour, and sex. Among all matched sets, we estimated the impact of COPD on fatigue (Fatigue Severity Scale), sleepiness (Epworth Sleepiness Scale), anxiety (Generalized Anxiety Disorder Questionnaire), depression (Personal Health Questionnaire-9), insomnia (Insomnia Severity Index), and function (Functional Outcomes of Sleep Questionnaire) using linear mixed effects models. We also examined whether the effect of COPD differed between those with (AHI ≥ 10 events/hour) and without (AHI < 10 events/hour) OSA.

Results: Overall, 56 patients with COPD were matched to a total of 199 non-COPD controls (51.0% males). The sample was middle aged (55.8 $\pm$ 11.8 years), overweight/obese (BMI 29.8 $\pm$ 6.9 kg/m²), and had mild/moderate OSA (AHI 11.0 $\pm$ 11.5 events/hour) on average; 26 (46.4%) of COPD cases had an AHI ≥ 10 . Among all patients, COPD was associated with worse PROs on average ($p < 0.05$ for all but ESS [$p = 0.070$]). Among those with AHI < 10 , there were no differences for any PRO between groups with and without COPD. However, COPD was associated with worse values of all PROs among those with OSA, including fatigue (mean [95% CI] difference = 9.8 [2.9, 16.7], $p = 0.006$), sleepiness (2.8 [0.01, 5.7], $p = 0.050$), anxiety (3.6 [1.1, 6.0], $p = 0.005$), depression (4.4 [1.8, 7.0], $p = 0.001$), insomnia (4.8 [2.0, 7.6], $p = 0.001$) and function (-3.3 [-5.2, -1.5], $p = 0.001$).

Conclusion: The effect of COPD on PROs is modified by OSA, with worse outcomes among those with OVS compared to OSA alone, but no impact of COPD among those without OSA. Identification of adults with OVS through early screening is crucial to prompt treatment of disease and reduce symptom burden.

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0872**PERIODIC LIMB MOVEMENTS DURING SLEEP AND HYPERTENSION: A SYSTEMATIC REVIEW AND META-ANALYSIS**Narat Srivali¹, Charat Thongprayoon², Supawit Tangpanithandee², Pajaree Krisanapan², Andrey Zinchuk³, Brain Koo⁴, Wisit Cheungpasitporn²¹ Yale School of Medicine, ² Mayo Clinic, ³ YALE UNIVERSITY,⁴ Yale

Introduction: Several studies suggest an association between periodic limb movements during sleep (PLMS) and

hypertension; however, a systematic evaluation of this relationship is lacking.

Methods: We conducted a systematic review and meta-analysis of observational studies that reported odds ratio, relative risk, hazard ratio, or standardized incidence ratio, comparing the risk of hypertension in persons with PLMS (defined by the level of periodic limb movements per hour of sleep depended on individual studies) versus those without PLMS. After assessing heterogeneity and bias, the pooled risk ratio and 95% confidence intervals (CIs) were determined using a random-effect, generic inverse variance method of DerSimonian and Laird.

Results: Out of 572 potentially relevant articles, six eligible cross-sectional studies were included in the data analysis which included 8,949 participants. The statistical heterogeneity of this study was insignificant, with an I² of 0%. A funnel plot showed no publication bias. The pooled risk ratio of hypertension in patients with PLMS was 1.26 (95% CI, 1.12–1.41).

Conclusion: Our analysis demonstrates an increased hypertension risk among patients with PLMS. Prospective or interventional studies are needed to confirm this association.

Support (if any):

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0873**PHYSICAL ACTIVITY, SLEEP, AND DEPRESSIVE SYMPTOMS AMONG COGNITIVELY IMPAIRED OLDER ADULTS**Debbie Chung¹, J Franco¹, R. Cobb², J. Pointek¹, Azizi Seixas³¹ Pace University, ² Rutgers University, ³ University of Miami Miller School of Medicine

Introduction: Cases of depressive symptoms are highly prevalent among older adults. Moreover, depression among older adults is strongly associated with cognitive impairment, with a prevalence of approximately 8% to 16% of aging adults (Blazer, 2003). Therefore, this study sought to investigate and examine the interplay between physical activity, insomnia, and depressive symptoms among cognitively impaired older adults without dementia using data from the Health and Retirement Study.

Methods: Depressive symptoms and insomnia levels are based on self-reports. We used a negative binomial to assess these relationships and present the incident rate ratios (IRRs) and 95% confidence intervals from our analysis of depressive symptoms associated with insomnia and moderate physical activity.

Results: We observed that insomnia (IRR: 1.18, 95% CI: 1.13–1.24) and moderate physical activity (IRR: 1.13, 95% CI: 1.07 – 1.19) are positively associated with an increase in depressive symptom levels among older adults. Model Two included an interaction term for insomnia and physical activity; results indicate that the interaction term is negative (IRR: .97 95% CI: .94 – .99). Model three tested gender to moderate the relationship between physical activity and depressive symptoms.

Conclusion: The results from the non-significant interaction term suggest that this relationship is non-significant. Similarly, the interaction term (gender x physical activity) results show that the link between physical activity and depressive symptoms did not vary by gender.

Support (if any):

Abstract citation ID: zsad077.0874

0874**REM SLEEP DETERIORATION MAY MODULATE TINNITUS**Robin Guillard¹, Damien Léger², Marco Congedo³, Alain Londero⁴

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Introduction: Sleep quality deterioration often acts as aggravating comorbidity in a variety of chronic conditions. Tinnitus is an auditory symptom that often negatively combines with poor sleep quality, and it has been associated with sleep fragmentation and sleep apnea. Tinnitus is known to be heterogeneous and yet the relationship between tinnitus psychoacoustic characteristics and how precisely sleep is impacted has initiated limited explorative studies, notably for a particular subgroup of patients, which describes that their tinnitus perceived loudness is highly modulated by sleep.

Methods: For this observational prospective study, a sample of 29 tinnitus subjects were recruited. The study group was composed of 15 “on-off tinnitus” subjects who were reporting significant modulations of tinnitus loudness related to night sleep and naps, and a control group composed of 14 subjects that described a constant and permanent tinnitus that was not impacted by sleep. The control group was matched in age, gender and tinnitus impact on quality of life with the study group. All patients underwent a polysomnography (PSG) assessment for one complete night and were asked to fill a screening questionnaire and report tinnitus intensity before and after the PSG.

Results: The “On-off tinnitus” group subjects had less Stage 3 sleep ($p < 0.01$), less Rapid-Eye Movement (REM) Sleep ($p < 0.05$) and more Stage 2 sleep ($p < 0.05$) in proportion and duration compared to the control group subjects. In addition, in the “On-off tinnitus” sample, a correlation was found between REM sleep duration and tinnitus overnight modulation ($p < 0.05$) as well as tinnitus impact on quality of life ($p < 0.05$). These correlations were not present in the control group.

Conclusion: This study demonstrates that among the tinnitus population, patients presenting a tinnitus whose intensity is highly modulated by sleep have a deteriorated sleep quality, in which REM sleep may play a role in the overnight tinnitus modulation. Potential physiological explanations accounting for this observation are hypothesized and discussed.

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0875**SELF-REPORTED SLEEP INDICES IN VETERANS EXPOSED TO DELETED URANIUM**Anthony Russo¹, Ali Baher¹, Patricia Gucer², Montserrat Diaz-Abad¹, Stella Hines¹, Melissa McDiarmid¹, Danielle Glick¹

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Introduction: During Gulf War I, a group of veterans sustained exposure to deplete uranium (DU) through a series of “friendly

fire” incidents. This resulted in both inhalational and traumatic injuries, with a subset having retained fragments and ongoing systemic exposure to DU. These veterans have undergone biennial surveillance assessments to monitor for DU-related health effects. While effects of DU on bones and kidneys have been consistently shown, less is understood about the effect of DU on sleep. In rat models, exposure to DU affected sleep architecture by increasing both sleep fragmentation and quantity of REM sleep. We therefore sought to characterize the effect of DU on self-reported sleep complaints among this unique veteran cohort. **Methods:** Of a dynamic cohort of 81 DU-exposed veterans, 37 completed medical history, exposure, and sleep questionnaires and 24-hour urine uranium collections. Responses on the sleep questionnaires -which included subjective assessment of sleep quality and quantity as well as an Epworth Sleepiness Scale (ESS) score – were compared in veterans with elevated (>0.1 mcg U/g creatinine) vs low urine uranium (uU).

Results: The 37 veterans assessed were all male, mostly white, and had a mean age of 54 ± 2.8 years. 10 were identified as having elevated urine DU levels. The mean ESS score for the group overall was in the pathologic range (13 ± 4) and did not differ significantly between the high and low uU groups. The most frequent complaints in the group overall were of difficulty falling asleep, awakening frequently throughout the night, restless sleep, and frequent tossing and turning. Among all self-reported sleep indices, there were no significant differences among the two groups.

Conclusion: In this group of DU-exposed veterans, excessive daytime sleepiness and several other sleep complaints were observed. Although there were no differences in the frequency or severity of self-reported sleep indices among this group of DU-exposed veterans, the group was overall pathologically sleepy. More work is needed to further characterize the possible impact of DU exposure on sleep.

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0876**SLEEP AND BODY MASS INDEX: THE ENDURING EFFECTS OF SLEEP DURATION AND WAKE AFTER SLEEP ONSET IN COLLEGE STUDENTS**Matthew Lico¹, Andrea Kozak¹, Jason Goldstick², Scott Pickett³

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Introduction: College students are an at-risk population for poor sleep health and higher body mass index (BMI), which are both linked to negative health outcomes later in life. Most studies examining the relationship between sleep and BMI are cross-sectional or have collected self-reported sleep data. Therefore, the current study aimed to examine the longitudinal relationship between an objective measure of sleep assessed with a Phillips Respironics Actiwatch 2 device and BMI in college students. It was hypothesized that poorer sleep health would be related to higher BMI.

Methods: At three time points across the first two years of college (i.e., 8 months apart), participants (N=116) wore an Actiwatch 2 device for one week and had their height and weight measured. The sample demographics were 71% female, 72% White or Caucasian, and an average BMI of 24.07. Sleep health

was defined by sleep duration, wake after sleep onset (WASO), sleep fragmentation, and midpoint of sleep. Each variable was scored as weekday (Sunday to Thursday) or weekend (Friday and Saturday).

Results: A linear mixed effects model using R was conducted after a person-mean variable (between person) and a person-mean centered variable (within person) were created for each participant. Weekday person-mean sleep duration was negatively related to BMI ($t = -2.81$), indicating shorter sleep duration was related to higher BMI across time. After controlling for between person effects, there were enduring relationships between both person-mean centered sleep duration ($t = -3.12$) and WASO ($t = 2.06$) and BMI, indicating that shorter sleep duration and greater WASO was related to higher BMI within participants across time. No significant relationships were found between weekend sleep variables and BMI.

Conclusion: The current findings add to a growing literature indicating that poor sleep health is related to increased BMI. In particular, the findings indicate that shorter sleep duration and greater WASO may increase risk for weight gain across time but are specific to weekday sleep behaviors. Although alterations in biological and behavioral processes likely serve as the mechanisms by which these variables influence BMI, additional research is needed to understand how this occurs and why weekday sleep behaviors are particularly important.

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0877

SLEEP AND PARKINSON'S DISEASE: PREVALENCE IN AN OUTPATIENT MEXICAN CLINIC

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Introduction: Sleep disturbance in patients with Parkinson's disease (PD) is highly prevalent. PD is the second most common progressive neurodegenerative disease, affecting about 1% of people over 60 years. Little is said about the sleep disorders in this disease, which are very frequent and frequently underdiagnosed. In Mexico, there are not a lot of studies on PD and sleep disorders in their population. University Hospital Dr. José E. González having the only Parkinson's clinic in the northeast of Mexico for the population without medical coverage, has recognized the importance of unreported sleep disorders in their broad patient population.

Methods: Patients of the outpatient clinic whom their medical query wasn't about sleeping disorder were screened using the following clinical tools: the Pittsburgh Sleep Quality Index (PSQI), the Patient Health Questionnaire (PHQ-9), the STOP-BANG Questionnaire, and the Epworth Scale. A full clinical history was also taken, focusing on sleep habits and risk factors that could contribute to sleep difficulties.

Results: A total of 65 patients (26 females, 39 males) that attended the outpatient Parkinson's clinic were screened for sleep disorders. Fifty-nine patients (90.7%) were identified with at least 3 risk factors for obstructive sleep apnoea with the STOP-BANG

questionnaire and were ordered polysomnography. Using the PSQI we identified 56 patients (86.1%) with low-quality sleep (defined as a score of 5 or higher). With the PHQ-9 we identified 41 patients (63%) with a high risk of depression, none of them were receiving treatment. And the Epworth Scale helped us identify 33 patients (50%) with a possible pathological excessive daytime sleepiness, none of them diagnosed.

Conclusion: PD is associated with multiple sleep disorders, which commonly impair quality of life. Routine inquiry about sleep problems from healthcare providers can increase its detection in a clinical setting outside of a sleep clinic and better management. Further research should focus on improving screening and diagnostic tools in the PD population. With this initiative, we present our experience and results incorporating routine screening for these disorders, future exploration toward this direction may hopefully shed light on developing effective, mechanisms-driven treatment options.

Support (if any):

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0878

SLEEP MEASURES WORSEN FOR INDIVIDUALS WHO ARE OBESE BUT IMPROVE FOR INDIVIDUALS WHO ARE NOT OBESE FROM 60-90 DAYS AFTER STROKE

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Introduction: Goals of post-stroke rehabilitation include recovery of physical function which, in turn, relies on motor learning to relearn functional skills. Given the known association between motor learning and sleep, it is important to understand if sleep is related to characteristics of persons with stroke (PwS) during the subacute timeframe (60–90 days following stroke) to potentially guide interventions. Obesity is a known risk-factor for stroke and therefore prevalent among PwS. The purpose of this study was to determine if there are differences between changes in objectively measured sleep parameters across the 60-90 day post-stroke period that correspond to different levels of body mass index (BMI).

Methods: PwS received standard of care for post-stroke physical rehabilitation, and wore wrist actigraphy for 3-9 nights at 60 and 90 days post-stroke, with no additional interventions. Total sleep time (TST), time in bed (TIB), sleep efficiency (SE), sleep latency (SL), wake after sleep onset (WASO), number of awakenings (NWAK) and average time per awakening (TPA) were obtained from the actigraphy software for each night, and average nightly values determined. Participants were categorized into two groups based on BMI (< 30 and ≥ 30). Changes were calculated as 90-day minus 60-day values. Independent samples t-tests were performed to determine if there were differences in changes in sleep parameters between BMI groups.

Results: The PwS sample ($n=31$, 52% female, average age 66.7 years, range 44–85+) included $n=13$ with BMI ≥ 30 . Independent t-tests found a significant difference in change in SE (6.9%, $p=0.016$) and change in NWAK (6.3, $p=0.003$) between the two groups. For those with BMI ≥ 30 SE and NWAK worsened from 60-90 days following stroke (-4.2% and 2 counts), whereas for those with BMI < 30 SE and NWAK improved

(+2.7% and -4.3counts). No significant differences were found between groups for changes in TST, TIB, SL, WASO or TPA.

Conclusion: Without sleep-related interventions, sleep characteristics worsen for PwS who are obese in the subacute post-stroke recovery phase, but improves for PwS who are not obese. There may be opportunities to explore sleep-related interventions for PwS who are obese.

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0879

THE ASSOCIATION BETWEEN OBSTRUCTIVE SLEEP APNEA AND GASTROESOPHAGEAL REFLUX DISEASE: A META-ANALYSIS AND SYSTEMATIC REVIEW

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Introduction: The relationship between obstructive sleep apnea (OSA) and gastroesophageal reflux disease (GERD) remains an area of controversy with varying hypotheses. Both disorders negatively impact health-related quality of life and lead to detrimental clinical outcomes. The aim of our study was to determine the association between OSA and GERD.

Methods: We performed a review of the literature across major databases including PubMed/MEDLINE, Embase, and Google Scholar in November 2021. Studies including patients with GERD and OSA were eligible for inclusion. The endpoints were to assess the association between OSA and GERD, the prevalence of OSA in patients with GERD or without GERD, and the prevalence of GERD in patients with or without OSA. Subgroup analyses were performed to determine whether body mass index (BMI), sex, smoking, or alcohol intake affect the degree of association. The total sleep time, sleep efficiency, and apnea hypopnea index (AHI) were compared between OSA patients with or without GERD. Results were pooled together using Reviewer Manager 5.4 software, and heterogeneity was quantified using I² statistics

Results: 6 studies involving 2950 patients with either GERD or OSA were included in the pooled analysis. Our findings suggest that there was a statistically significant association between GERD and OSA (OR=1.67, 95% CI [1.18, 2.37], P=0.004). The prevalence of GERD was higher in patients with OSA compared to those without OSA (OR=1.63, P=0.001). Conversely, there was no difference in the prevalence of OSA in patients with or without GERD (OR=1.94, P=0.11). Subgroup analysis shows that BMI, sex, smoking, and alcohol intake did not alter the association between GERD and OSA. In patients with OSA, there were no statistically significant differences in the total sleep time, sleep efficiency, and AHI between those with or without GERD. The mean differences were -5.89 minutes (P=0.19), -0.81% (P=0.67), and 0.80 (P=0.83), respectively.

Conclusion: Our results showed an increased prevalence of GERD is observed in patients with OSA but not vice-versa. However, the presence of GERD does not alter the total sleep time, sleep efficiency, and AHI in patients with OSA. BMI, sex, smoking, and alcohol intake do not seem to affect the strength of this association.

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0880

THE BURDEN OF NON-ALCOHOLIC FATTY LIVER DISEASE ON ACUTE HEART FAILURE ADMISSIONS IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive Sleep Apnea (OSA) is prevalent in heart failure and is associated with cardiovascular and all-cause mortality. The evidence is growing that Non-Alcoholic Fatty Liver Disease (NAFLD) is associated with increased cardiovascular morbidity and mortality. There is limited scientific evidence of clinical outcomes in patients with Acute Heart Failure (AHF), OSA and NAFLD. Therefore, we sought to investigate this population.

Methods: We queried the National Inpatient Sample (NIS) between 2017-2020 for adult patients hospitalized for AHF with history of OSA & had NAFLD. The primary outcome was in-hospital mortality. The secondary outcomes were in-hospital cardiogenic shock, gastrointestinal bleeding (GIB), cardiac arrest, invasive mechanical ventilation (IMV) and length of stay (LOS). Multivariable logistic and Poisson regression analyses were used to estimate clinical outcomes. P-value < 0.05 was statistically significant.

Results: We identified 1,029,785 hospitalizations for AHF with history of OSA: NAFLD in 138,415 (3.7%). AHF with OSA and NAFLD vs. no NAFLD had mean age 65.8 vs. 67.9, males 62.2% vs. 59.2%, Caucasian race 71.6% vs. 68.7%, obesity 50.8%, 55.6%, atrial fibrillation 53.6% vs. 50.5%, diabetes 61.3% vs. 60.4%, anemia 24.8% vs. 20.3%, CKD 56.9% vs. 51.7 and COPD 42.7% vs. 48%. In-hospital mortality was 11.9% in the NAFLD group vs. 2.6% in the non-NAFLD group (aOR 5.2, P< 0.001). AHF and OSA with NAFLD vs. non-NAFLD groups had GIB 6.4% vs. 2.8% (aOR 2.4, P< 0.001), cardiac arrest 4% vs. 1.1% (aOR 3.7, P< 0.001), cardiogenic shock 13.1% vs. 2.6% (aOR 5.2, P< 0.001), IMV 13.2% vs. 5% (aOR 2.9, P< 0.001) and LOS 9.1 vs. 6.6 days (aIRR 1.3, P< 0.001).

Conclusion: In patients with OSA admitted for AHF, NAFLD is independently associated with five times higher odds of in-hospital mortality. It's also associated with a significantly higher incidence of cardiac arrest, cardiogenic shock, IMV and increased hospital LOS. The NAFLD group patients were younger, less obese, with more anemia and CKD. The chronic inflammatory process and humoral dysregulation associated with OSA and NAFLD would induce worsening outcomes of AHF hospitalization. Further research is needed on the impact of OSA optimization in patients with heart failure and NAFLD.

Support (if any):

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0881**THE CLINICAL AND POLICY IMPACT OF INCREASING AWARENESS ABOUT SLEEP AND CVD HEALTH THROUGH PUBLIC HEALTH PROGRAMS FOR WOMEN**

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Introduction: Sleep is important for cardiometabolic health (CVH) and cardiovascular disease (CVD) prevention, especially for women. Relative to men, women have less awareness of CVD risk factors. Particularly, minority women have disproportionately higher prevalence of short sleep and CVD risk awareness. The primary objective of this review is to investigate the clinical, public health, and policy implications of three major public health programs: the Go Red for Women campaign, the Heart Centers for Women initiative, and the HEART for Women Act, on increasing CVD and sleep health awareness among women in the United States. The secondary objective is to create public health action plan to increase awareness of sleep health and CVD risk. The third objective is to describe barriers and facilitators of implementing the public health action plan for minority women.

Methods: To assess the impact of these interventions, a systematic review was conducted. Studies that directly examined the impact of the 3 CVD awareness programs on the prevalence of CVD in the U.S. Next, studies that evaluated the level of awareness of CVD risk factors and sleep were identified. The current literature was synthesized and described qualitatively to elucidate individual, provider, community and policy knowledge gaps in CVD and sleep health programs for women.

Results: Prevalence of CVD deaths among women decreased from 459,000/year in 2004 to 339,500/year in 2015. Majority of these interventions include diet, exercise, and smoking cessation and exclude sleep and. Of the three programs, the Go Red for Women campaign proved to have the greatest public health and policy impact. From the results of systematic review, we created a public health action plan to increase awareness of sleep health and CVD risk. Third, we found patient, provider, and policy barriers and facilitators of implementing the public health action plan for minority women.

Conclusion: Public health action plans that focus on sleep health should be culturally sensitive to all women and accessible to those that live in both rural and urban areas addressing the importance of sufficient sleep and its benefits to CVH.

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0882**THE LONGITUDINAL RELATIONSHIP BETWEEN OBJECTIVE SLEEP AND CARDIOVASCULAR PARAMETERS DURING PREGNANCY**

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Introduction: Growing evidence shows the important role of sleep on cardiovascular health in pregnant women with nearly

50% self-reporting poor sleep quality and 30% insufficient sleep. These sleep disturbances have been associated with adverse perinatal outcomes (e.g., hypertension, preterm births). Many studies have only used self-reported questionnaires during pregnancy. However, a few studies have utilized sleep labs and found that subjective and objective assessments of sleep varied from poor to low associations. The aim of this study was to examine the longitudinal relationship between objective sleep and cardiovascular parameters in pregnant women.

Methods: Seventeen healthy pregnant women with 88% self-identifying as Hispanic were consented to participate in the longitudinal observation study. Their average age was 27.8 years (SD=4.48). A validated Oura ring was used to daily monitor objective sleep and cardiovascular parameters across the pregnancy, including resting heart rate (HR), heart rate variability (HRV) indicated by RMSSD (root mean square of successive differences) of interbeat intervals, deep, light, and Rapid EYE Movement (REM) sleep, awake time and sleep onset latency. Mixed effects models were conducted to analyze daily changing patterns of these parameters using R-4.2.0 for Mac.

Results: Over the pregnancy, when deep and light sleep increased by 1 hour, heart rate decreased by 5.55 bpm ($p < 0.001$) and 1.32 bpm ($p = 0.01$), respectively; when REM sleep increased by 1 hour, heart rate increased by 2.15 bpm ($p = 0.049$). Conversely, when deep and light sleep increased by 1 hour, RMSSD increased by 10.32 ms ($p < 0.001$) and 2.93 ms ($p < 0.02$), respectively; when REM sleep increased by 1 hour, RMSSD decreased by 7.27 ms ($p = 0.001$). There were no significant associations between HR/RMSSD and awake time/sleep onset latency.

Conclusion: This study appears to be the first to investigate the longitudinal relationship between sleep and cardiovascular parameters among primarily Hispanic pregnant women in the U.S. in a non-lab setting. Our study provides preliminary evidence that longer deep/light sleep and shorter REM sleep may improve cardiovascular health among pregnant women.

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0883**UNDERSTANDING HOW NAPS MAY MODULATE TINNITUS**

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Introduction: Tinnitus is a debilitating auditory symptom that globally impacts the quality of life of patients. Sound exposure, stress, and somatosensory stimuli (e.g. neck and jaw movements) are tinnitus modulators that have been commonly described and studied. Napping may also increase tinnitus loudness upon awakening in a minority of subjects. To our best knowledge this

modulation and its potential pathophysiological mechanisms has never been systematically assessed.

Methods: For this observational prospective study, we studied 37 tinnitus subjects complaining of significant naps-related tinnitus modulations. All subjects performed 6 naps attempts under polysomnography over 2 days. Audiological, electrophysiological as well as jaw and neck muscles mobility and sensitivity assessments were completed before and after each nap. In addition, subjects filled a screening questionnaire and underwent a tinnitus pitch-matching procedure.

Results: 197 naps attempts were collected. It was confirmed that overall naps were increasing tinnitus loudness ($p < 0.001$). First naps of the day yielded more important tinnitus modulations than second ($p < 0.05$) and third naps ($p < 0.01$) suggesting a saturation effect. Analyses conducted so far highlight that nap sleep duration correlates with observed tinnitus modulation ($p < 0.05$) and that audiometric thresholds at tinnitus closest frequency do not seem to be affected by tinnitus modulation. Neither jaw mobility nor sensitivity were correlated with tinnitus modulation. Analyses to come will assess if sleep apnea, sleep bruxism, cervical mobility or sleep position may correlate with tinnitus nap modulations.

Conclusion: This study demonstrated that in a subgroup of tinnitus patients naps may modulate tinnitus. Nap sleep duration more than jaw muscles sensitivity seem to be correlated with these modulations.

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0884

USER NEEDS AND PREFERENCES FOR A SMARTPHONE APP TO TREAT INSOMNIA IN CANCER SURVIVORS

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Introduction: Cancer patients with insomnia have unique needs and require tailored healthcare interventions. iCANSleep is a mobile health intervention aimed at providing evidence-based insomnia treatment via a smartphone app. As part of a user-centered development process, virtual needs assessment interviews were conducted with cancer survivors who report insomnia to determine the needs and preferences of this patient group for insomnia treatment.

Methods: 22 cancer survivors from 5 Canadian provinces completed an online survey and participated in a needs assessment interview. Surveys were analyzed using descriptive statistics, while interviews were transcribed and analyzed using thematic analysis.

Results: 81.8% (18/22) of cancer survivors report that their insomnia started or was exacerbated during the time of their cancer diagnosis and treatment. Of the participants who discussed insomnia with a medical provider, hypnotic medications were prescribed in 64.3% (9/14) of cases. With some exceptions, participants reported strong familiarity with smartphone technology, had experience using apps for health management, and found an insomnia treatment app highly acceptable. Participant-identified facilitators of app use included ease of access, lack of cost, anonymity, empirical basis, and recommendation by local care teams. Smartphone ownership, cumbersome user interface, and limited access to internet were raised as potential challenges

of implementation. Additional functionality identified by participants included options to link consumer wearable devices, additional modules to address comorbid conditions such as pain and anxiety, and an anonymous peer support forum.

Conclusion: Mobile apps hold promise as an avenue for the effective delivery of insomnia treatment; however, treatments must be evidence-based, and apps must be designed for maximum ease of use. Findings provide novel insight into how to best promote uptake and sustained use of mobile health interventions in cancer survivors and will be used to develop functional guidelines.

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0885**ALZHEIMER'S DISEASE PROGRESSION RISK IN COGNITIVE NORMAL OLDER ADULTS WITH OBSTRUCTIVE SLEEP APNEA USING NIA-AA RESEARCH FRAMEWORK**

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Introduction: We determined risk profiles of strata-specific cognitive-normal (NL) older-adults with obstructive sleep apnea (OSA) characterized by their A β , P-Tau & T-tau (ATN) burden, on prospective AD stage-transition

Methods: Longitudinal study utilizing data from 167 community-dwelling NL older-adults participating in NYU studies on memory, sleep and aging. Subjects had baseline CSF AD-biomarker data and at least two follow-up clinical and neuropsychological data. OSA was defined using AHI4%. Using the NIA-AA Research Framework, data-driven, clinically relevant thresholds for CSF-A β 42 (≤ 375 pg/ml), P-tau (≥ 53.7 pg/ml) and T-tau (≥ 367 pg/ml) indicated ATN status respectively. Twenty-four participants with suspected non-AD pathologic change defined as A-T+ were excluded leaving 143 for the analysis. Main outcome was AD stage-transition (i.e., change from Global Deterioration Scale (GDS) 1 or 2 [NL] at baseline to ≥ 3 [MCI] during follow-up). Logistic mixed-effects models with random intercept and slope were used to assess associations between ATN characterized OSA subjects, and longitudinal AD stage transition, controlling for age-at-baseline, sex, APOE4-status, years-of-education, and their interactions with time.

Results: Of the 143 participants, 91 (63.8%) were women. The mean (SD) age was 69.6 (7.3) years and follow-up time was 4.73 (3.45) years. Sixteen (11.2%) were OSA+/A+/TN-, and 21 (14.7%) were OSA-/A+/TN-. Ninety-two (64.3%) had normal AD biomarkers (OSA+/A-/TN- [n=45] and OSA-/A-/TN- [n=47]). To generate strata-specific risks, subjects were combined into groups: (i) OSA subjects with AD pathologic change OSA+/A+/TN- [n=25] consisting of OSA+/A+/TN+ [n=9] plus OSA+/A+/TN- [n=16] (ii) non-OSA subjects with AD pathologic change OSA-/A+/TN- [n=26] consisting of OSA-/A+/TN+ [n=5] and OSA-/A+/TN- [n=21] Fourteen subjects (9.8%) transitioned from NL to MCI (i.e., OSA+/A+/TN- [6/25], OSA-/A+/TN- [3/26], OSA+/A-/TN- [4/45] and OSA-/A-/TN- [3/47]). OSA+/A+/TN subjects were at higher risk of AD stage-transition relative to OSA-/A-/TN- ($\beta = 1.31$, 95%CI, 1.02, 1.62); OSA+/A-/TN- ($\beta = 0.89$, 95%CI, 0.42, 1.37); and OSA-/A+/TN subjects, ($\beta = 0.71$, 95%CI, 0.38, 1.04); $P < .01$ for all. OSA+/A-/TN- vs. OSA-/A-/TN- participants did not show differences in cognitive change over time ($\beta = 0.22$, 95%CI, -0.15, 0.39, $P = .17$).

Conclusion: Among ATN characterized NL older-adults with OSA, those with evidence of AD pathologic change have the greatest risk of developing AD.

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0886**DAYTIME SLEEPINESS IN THE DEVELOPMENT OF ALZHEIMER'S DISEASE**

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Introduction: Obstructive sleep apnea (OSA) is common in older adults and has recently been implicated in pathogenesis of Alzheimer's disease (AD). Sleep disruption is a possible reversible cause of memory impairment. Furthermore, quality of sleep has been determined to be one of the most important variables affecting overnight memory consolidation. Men and women differ in frequency and type of sleep complaints. As part of a larger study, data are presented on sex-stratified correlations between sleepiness and sleep-dependent memory consolidation in cognitively normal older adults with OSA.

Methods: Forty-Three participants (age 65 to 81 years; M=70.5 years, SD=4.3) deemed cognitively normal based on a Montreal Cognitive Assessment [MOCA] score of >26 were analyzed. The sample was 48.9% women; 86% White; 90.7% Non-Hispanic; and 73.8% with a bachelor's degree or higher. The Epworth Sleepiness Scale (ESS) was used to assess general daytime sleepiness. Sleep-dependent memory consolidation was assessed using the Word-pairs Association (WPA) task. The WPA task shows a word pair for 5 seconds for the participant to learn and the next morning, post-sleep, the delayed recognition test is performed.

Results: Preliminary descriptive analyses revealed women had an average ESS of 5.4 (SD=3.0) and WPA score of 29.6 (SD=4.3); while men had an average ESS of 6.9 (SD=2.99) and WPA of 29.5 (SD=7.4). Non-parametric correlations, assessed to examine the association between ESS sum scores and WPA scores, revealed a significant negative correlation between ESS and WPA for female sex, but not for male sex. That is, in women, greater daytime sleepiness scores were associated with worse sleep-dependent memory consolidation ($r = -.66$, $p = .01$).

Conclusion: Preliminary findings of the ongoing study provide support for a sex specific association between daytime sleepiness and sleep-dependent memory consolidation. Further research on this topic is needed to determine optimal preventative strategies for older adults at risk of cognitive decline.

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0887**DIVERGENT SLOW WAVE SLEEP AND ALZHEIMER'S DISEASE PLASMA BIOMARKERS' ASSOCIATIONS IN BLACK AND WHITE COGNITIVE NORMAL OLDER-ADULTS**

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Introduction: We determined whether slow wave sleep is associated with plasma levels of A β 40, A β 42, A β 42/A β 40, Tau, tau/

A β 42 and NfL and whether this relationship differed between Blacks/African-Americans and non-Hispanic Whites.

Methods: This was a cross-sectional analysis of baseline data from 171 community-dwelling cognitively normal older-adults, participating in ongoing NYU studies on memory, sleep and aging. Non-rapid eye movement sleep (NREM) slow wave sleep (SWS) duration was calculated from 2 nights of in-lab NPSGs. Plasma A β 40, A β 42, Tau and NfL were determined using single molecule array (SIMOA). Associations of NREM SWS duration and plasma AD biomarker levels were assessed using adjusted generalized linear models and Pearson correlation analysis after data normalization. Analyses were adjusted for age, sex, BMI, race, and education.

Results: Of the 171 subjects (128 non-Hispanic Whites and 43 Blacks/African-Americans), 112 (65.5%) were females, and mean (SD) age was 68.6 (6.6) years, BMI was 27.6 (6.1) kg/m², and education was 16.9 (2.1). There were no racial differences in age, sex, BMI, NREM SWS and AHI4%. Compared to non-Hispanic Whites, Blacks/African-Americans had significantly lower years of education (14.2 vs. 17.2, $p < .01$), plasma A β 40 (248.3 vs. 262.5 pg/ml) and NfL levels (11.4 vs. 15.2 pg/ml) $p < .05$ for both. There were no significant racial differences in levels of plasma A β 42, A β 42/A β 40, Tau, Tau/A β 40 and Tau/A β 42 ($p > .05$ for all). NREM SWS duration was not associated with plasma A β 42, A β 40 or tau in the overall sample ($p > .05$ for all). However, in non-Hispanic Whites, NREM SWS negatively correlated with plasma A β 42 ($r = -0.28$, $p < 0.05$), plasma A β 40 ($r = -0.087$, $p = 0.72$), though not significant, and plasma Tau ($r = -0.153$, $p = 0.27$), though not significant. In Black/African-Americans, NREM SWS positively correlated with plasma A β 42 ($r = 0.48$, $p = 0.05$), plasma A β 40 levels ($r = 0.32$, $p = 0.04$), and plasma Tau levels ($r = 0.52$, $p = 0.04$). NREM SWS was not associated with plasma tau/A β 42, plasma tau/A β 40 or plasma NfL in the overall sample and across racial subgroups.

Conclusion: Race-specific divergent associations between NREM SWS and plasma A β 42, A β 40 & Tau may suggest differences in SDOH factors and mechanisms that could influence sleep and AD-risk in older-adults.

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0888

INDIVIDUALS WITH REM SLEEP BEHAVIOR DISORDER SHOW INCREASED PARKINSONISM WITH COMORBID NEUROTRAUMA: A NAPS CONSORTIUM SUBSTUDY

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Introduction: Rapid eye movement (REM) sleep behavior disorder (RBD) is strongly associated with progressive phenocconversion to an overt synucleinopathy (e.g., parkinsonism). Neurotrauma [i.e., traumatic brain injury (TBI) and post-traumatic stress disorder (PTSD)], increases the odds of RBD diagnosis by ~2.5-fold and is associated with an increased later diagnosis of Parkinson's Disease (PD), a service-connected

illness in Veterans. Thus, RBD and neurotrauma are both independently associated with parkinsonism; however, it is unclear how neurotrauma influences neurological symptoms and exam findings in patients with RBD.

Methods: Participants ≥ 18 years of age with overnight polysomnogram-confirmed RBD were enrolled between 8/2018 to 4/2021 as part of the North American Prodromal Synucleinopathy (NAPS) Consortium. Standardized assessments for RBD, TBI, and PTSD history, as well as cognitive, motor, sensory and autonomic function were completed. This sub-study applied a cross-sectional, case-control (1:4 ratio) analysis comparing cases ($n = 24$; RBD+TBI+PTSD) to controls ($n = 96$; RBD) matched for age (± 2 years), sex, and years of education (± 2 years).

Results: Participants with neurotrauma reported an earlier age of RBD symptom onset and more severe RBD phenotype, more severe anxiety and depression, greater frequency of hypertension, and significantly worse cognitive, motor, and autonomic function compared to participants without neurotrauma.

Conclusion: This cross-sectional, matched case:control study showed that individuals with comorbid neurotrauma and RBD have significantly worse neurological outcomes related to common features of early parkinsonism. Although confirmatory longitudinal studies are still ongoing, these results may be a sign of further/faster progression of synucleinopathy in those with comorbid neurotrauma and RBD.

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0889

ISOLATED RAPID EYE MOVEMENT SLEEP BEHAVIOR DISORDER: DIFFERENCES BETWEEN SEXES AT PRESENTATION

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Introduction: Most older adults with isolated REM sleep behavior disorder (iRBD) are men, yet in younger adults there is greater parity between the sexes. Whether the clinical characteristics between women and men with iRBD may differ remains unclear. We aimed to analyze presenting clinical and demographic characteristics of iRBD in men and women.

Methods: We identified 130 women and 130 men with PSG confirmed iRBD who were matched for time of polysomnographic diagnosis, abstracted their clinical histories, and comparatively analyzed clinical characteristics between the sexes.

Results: RBD symptom onset average age (50.4 ± 20.0 vs. 55.4 ± 16.9 years, $p = 0.03$) and age at diagnosis (56.4 ± 16.7 vs. 62.5 ± 13.3 years, $p < 0.01$) were younger in women than in men. Injury frequency was similar between groups. Antidepressant use prior to diagnosis (80.8% vs 53.0%, $p < 0.01$), psychiatric comorbidity (79.8% vs. 50.8%, $p < 0.01$) and chronic pain syndrome (39.2% vs. 17.4%, $p < 0.01$) diagnoses were more frequent in women than men. Insomnia (31.5% vs. 18.2%, $p = 0.01$), hypersomnolence (50.8% vs 37.9%, $p = 0.04$) and overlap parasomnia disorder (13.8% vs 9.8%, $p = 0.06$) were more frequent in women than men, while sleep apnea (43.1% vs. 70.5%, $p < 0.01$) and vascular co-morbidity (62.3% vs 83.3%, $p < 0.01$) occurred

more frequently in men than women. Autoimmunity was similar between sexes.

Conclusion: Women were younger when diagnosed, and had more frequent psychiatric diagnoses and antidepressant use, with different comorbid sleep disturbances and comorbidities than men with iRBD. Key sex differences in iRBD could imply different etiologies and aid accurate and timely diagnosis.

Support (if any):

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0890

MULTIPLE SLEEP MEASURES AND COGNITION BY RACE/ETHNICITY AND AGE

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Introduction: Disturbed sleep may affect cognition directly (e.g., through sleep fragmentation) and indirectly through effects on related health outcomes (e.g., cardiovascular health). However, investigations of sleep and cognition among diverse racial/ethnic samples and women are sparse.

Methods: We analyzed longitudinal associations among 50,000 Sister Study participants (enrollment: 2003-2009) who reported on short (< 7 hours) and long sleep duration (>9 hours), sleep debt (≥2-hour difference between longest and shortest sleep duration during the week), frequent napping (≥3 times/week), and insomnia symptoms. Participants completed an eight-item Dementia Screening Interview during two follow-up periods (2012-2014; 2017-2019). Poor cognition was quantified as a change in cognitive function indicative of impairment in ≥2 items. Adjusting for sociodemographic and health behavior characteristics, we used log-binomial regression to estimate risk ratios (RRs) and 95% confidence intervals (CIs) for associations between sleep dimensions and cognition, by race/ethnicity and age.

Results: Mean age was 55±8.9 years, 83% self-identified as Non-Hispanic [NH]-White, 9% NH-Black, and 5% Hispanic/Latina. Compared to NH-White women, NH-Black and Hispanic/Latina women reported higher prevalence of all poor sleep dimensions but lower prevalence of poor cognition. Participants with short and long sleep duration, sleep debt, napping, and insomnia symptoms had a higher prevalence of poor cognition (RR=1.09 [95% CI: 1.03-1.16]; RR=1.19 [1.06-1.35]; RR=1.18 [1.11-1.25]; RR=1.27 [1.18-1.39]; RR=1.33 [1.26-1.41], respectively). Estimates for short sleep with poor cognition were higher among minoritized racial/ethnic groups (RRNH-Black=1.15 [0.91-1.45]; RRHispanic/Latina=1.48 [1.09-2.03]; RRNH-White=1.08 [1.01-1.15]), although interaction terms were not statistically significant (p-value= 0.37 and 0.07, respectively). Patterns were similar for insomnia. Sleep debt and insomnia symptoms estimates with poor cognition were higher among younger than older groups (sleep debt: RRAge 26-55 years=1.20 [1.11-1.31]; RRAge 56-76 years =1.14 [1.05-1.25]; insomnia: RRAge 26-55 years=1.39 [1.27-1.51]; RRAge 56-76 years =1.27 [1.18-1.38]). Interaction terms were non-significant (p-value= 0.96 and 0.26, respectively).

Conclusion: Poor sleep health was associated with poorer cognition, and associations may be stronger among minoritized and younger women. Future studies using a life course perspective among large, more diverse populations can elucidate how early-life and later-life factors (e.g., psychosocial experiences;

environmental conditions) accumulate to impact sleep health and contribute to differential cognitive risk in adulthood.

Support (if any):

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0891

SEX-SPECIFIC DIFFERENCES IN POLYSOMNOGRAPHIC BIOMARKERS OF SLEEP DISRUPTION AND SLEEP DISORDERED BREATHING IN MIGRAINE

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Introduction: The importance of sex as a biological variable on the relationship of migraine and sleep disturbance has not been well-characterized. Given evidence of 1)bidirectional relationships of poor sleep and migraine severity and 2)greater activation of brain regions involved in emotional processing in women compared to men with migraine, we hypothesized that sleep architectural disruption may contribute to sex-specific differences in quality of life measures, particularly those attributed to emotional processing.

Methods: This was a retrospective cohort study of migraine patients aged >18 years seen in the Cleveland Clinic headache program with polysomnogram data. Migraine burden was measured by the 20-item migraine-specific quality of life(MSQOL) encompassing three domains: emotional function(EF), role function-preventative, and role function-restrictive. Linear regression models were used to assess the association of each MSQOL domain with sleep architectural measures and the statistical interaction with sex was examined. Coefficients and 95% confidence intervals were estimated and compared with adjustment of age, race, body mass index(BMI) and comorbidities.

Results: Of 245 patients with migraine, 37(15.1%) were male. Males had higher AHI (10.0[5.3, 18.5] vs. 5.7[1.8, 11.4], p=0.006). The difference in MSQOL-EF scores was not statistically significant (males:73.3[53.3,86.7] vs. females:60.0 [33.3,80.0], p=0.066). There was no statistical difference in percent N2 or REM between sexes, though males had greater %N1, and lower %N3 (10.9[5.9,19.2] vs. 6.6[4.1,11.9],p=0.039). The association of MSQOL-EF with percent of N2 and REM sleep differed by sex. For each 5% increase in N2, there was a 5% reduction of MSQOL-EF 2.08 (-2.08, 95%CI [-6.86,2.70],p=0.39) in females compared to a 6.84 reduction in males (-6.84, 95%CI [-15.9,2.22],p=0.14), p-value for interaction=0.044. For each 5% increase in REM, MSQOL-EF increased 1.26 (1.26, 95%CI [-3.68,6.21],p=0.61) in females, and increased by 6.27 in males (6.27, 95%CI [-3.11,15.6], p=0.19),p-value for interaction=0.044.

Conclusion: Although males had greater sleep disruption compared to females, there was no significant difference in MSQOL-EF scores. However, sex-specific differences of extent of sleep stage composition and MSQOL-EF were observed suggesting influence of sleep architectural alterations on greater responsivity of migraine emotional processing in men versus women. Future investigation should better characterize longitudinal relationships and underlying neurobiological mechanisms underlying these findings.

Support (if any): Association of Migraine Disorders

Abstract citation ID: zsad077.0892

0892**INSOMNIA AND POOR SLEEP EFFICIENCY PREDICT COGNITIVE DECLINE AMONG NON-DEMENTED ELDERLY: FINDINGS FROM THE CRETAN AGING COHORT**

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Introduction: Previous cross-sectional studies have shown that insomnia symptoms and objective short sleep are associated with disease severity in patients with Mild Cognitive Impairment (MCI) and Dementia. Our aim was to examine the longitudinal associations between sleep quality/quantity with cognitive progression in non-demented community-dwelling elderly.

Methods: A sub-sample of 105 participants (77.5% females) from a large population-based cohort in Crete, Greece of 3,140 older adults (>60 years; baseline) were followed up 8 years later (follow-up). All participants underwent neuropsychiatric/neuropsychological evaluation on both phases. At baseline, subjective sleep complaints and objective sleep variables based on 3-day 24 hour actigraphy were assessed. The impact of baseline objective sleep characteristics and/or insomnia (as defined by at least two subjective sleep complaints) on cognitive progression was assessed with univariate and multivariate models controlling for confounders.

Results: At baseline 50 participants were diagnosed as CNI and 55 as MCI; at follow-up 60 participants (57.1%) displayed clinically significant cognitive deterioration while the remaining showed relatively stable cognitive status. The frequency of persons reporting insomnia symptoms at baseline was higher among those who displayed cognitive deterioration (31.7%) than those in the cognitively stable group (13.3%, $p=0.037$). Logistic regression analysis showed that participants with insomnia symptoms at baseline, were significantly more likely to deteriorate cognitively at follow-up ($p=0.05$, $OR=2.90$). Also, among objective sleep variables added to the model, it was poor sleep efficiency that was associated with cognitive deterioration ($p=0.035$, $OR=3.48$).

Conclusion: More than half of the participants displayed significant cognitive deterioration over 8 years and this decline was predicted by insomnia symptoms and objective poor sleep efficiency at baseline. Improving both quality and quantity of sleep may significantly delay the deterioration of cognitive function in non-demented community-dwelling elderly.

Support (if any): National Strategic Reference Framework (NSRF) - Research Funding Program: THALES entitled "UOC-Multidisciplinary network for the study of Alzheimer's Disease" Grant Cod: MIS 377299 HELLENIC FOUNDATION

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Abstract citation ID: zsad077.0893

0893**LONG OBJECTIVE SLEEP DURATION IS A MARKER OF COGNITIVE IMPAIRMENT AMONG OLDER ELDERLY: FINDINGS FROM THE CRETAN AGING COHORT**

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Introduction: We have previously shown that although sleep duration is similar between cognitively non-impaired (CNI) elders and patients with Mild Cognitive Impairment (MCI), long sleep duration is associated with disease severity in patients with multi-domain MCI and Dementia. Our aim was to examine the associations between sleep duration and cognitive status in subjects with CNI and MCI followed 8 years later.

Methods: A sub-sample of 110 participants (77.3% females) were recruited from a large population-based cohort in Crete, Greece of 3,140 older adults (>60 years). Participants with an initial diagnosis of CNI ($n=57$) and MCI ($n=53$) (mean age at baseline=72.7 years [$SD=6.8$]) were followed-up 8 years later (mean age at follow up=80.5 years [$SD=6.7$]). All participants underwent neuropsychiatric/neuropsychological evaluation (baseline & follow-up) and a 7-day 24h actigraphy (follow-up). Sleep duration measured as night Total Sleep Time (TST) at follow-up was compared between the diagnostic groups using ANCOVA controlling for age, gender, depression symptom severity, psychotropic medication. Long sleep duration was defined by values >75% percentile of the total sample distribution on each sleep index.

Results: At follow up 62.7% of participants have deteriorated cognitively with 29 being diagnosed with CNI, 49 with MCI and 32 with dementia. Patients with dementia had significantly longer night TST (mean=493, $SD=106$ min) than persons with MCI (mean=453, $SD=68$ min, $p=0.05$) who in turn had longer night TST than CNI participants (mean=409, $SD=58$ min, $p=0.02$). Also, long night sleep duration was significantly more prevalent among dementia patients and MCI compared to CNI individuals [67.7% vs. 36.7% vs. 10.3%, respectively; all $p<0.02$].

Conclusion: Our study confirms and expands previous findings that objective long sleep duration is a marker of worse cognitive status in elderly with MCI or Dementia and that this association is even stronger in old-old individuals.

Support (if any): National Strategic Reference Framework (NSRF)-Research Funding Program: THALES entitled “UOC-Multidisciplinary network for the study of Alzheimer’s Disease” Grant Cod: MIS 377299 HELLENIC FOUNDATION FOR RESEARCH AND INNOVATION (HFRI)- Research Funding Program: ELIDEK entitled “Sleep Apnea (OSA) and poor sleep as Risk Factors for decreased cognitive performance in patients with Mild Cognitive Impairment: the Cretan Aging Cohort (CAC)”, Grant Cod: HFR1-FM17-4397

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0894

IMPULSIVITY ACROSS EARLY STAGES OF SYNUCLEINOPATHY: FROM HIGH-RISK RELATIVES, REM SLEEP BEHAVIOR DISORDER TO PARKINSON’S DISEASE

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Introduction: Increased impulsivity is a common neuropsychiatric feature in patients with Parkinson’s disease (PD), especially attributed to the use of dopaminergic medications. Interestingly, emerging evidence suggested that impulsivity had changed in drug-naïve PD patients. However, it remains unclear whether impulsivity has been altered in prodromal stage of PD, namely isolated rapid eye movement sleep behavior disorder (iRBD) and their high-risk relatives.

Methods: This was a cross-sectional study with four groups of subjects, including early drug-naïve PD patients, patients with iRBD and their first-degree relatives (iRBD-FDRs, a high-risk group with potential prodromal RBD features), and controls. A panel of neuropsychological computerized tasks, including go/no-go task, four-choice serial reaction time task (4CSRTT), beads task, balloon analogue risk task (BART) and delay/effort discounting task, would measure various dimensions of motor and decisional impulsivity.

Results: A total of 331 subjects were recruited, including 27 early drug-naïve PD patients (mean age $\pm$ SD: 70.1 $\pm$ 5.8 years, 77.8% man), 152 iRBD patients (67.2 $\pm$ 6.6 years, 77.6% man), 68 iRBD-FDRs (63.2 $\pm$ 6.4 years, 51.5% man), and 84 controls (67.4 $\pm$ 8.1 years, 61.9% man). Early drug-naïve PD and iRBD patients had fewer numbers of extracted beads in beads task 1 ($P < 0.001$) and task 2 ($P < 0.001$) in making decisions and fewer numbers of pumps of unexploded blue balloons in BART ($P < 0.001$) than controls and iRBD-FDRs, suggesting a higher level of reflection impulsivity and a lower level of risk taking, respectively. In addition, early drug-naïve PD and iRBD patients had more no-go errors in go/no-go task ($P = 0.023$), suggesting a marginally lower level of response inhibition in PD and iRBD groups. Early drug-naïve PD and iRBD patients had more premature responses in 4CSRTT than iRBD-FDRs ($P = 0.008$). The

delay and effort discounting indexes were comparable among four groups.

Conclusion: While risk taking and response inhibition decreased, reflection impulsivity actually increased in iRBD and drug-naïve PD patients. These novel findings indicated that a complex construct of altered impulsivity has already occurred at the earlier stage (at iRBD) of α -synucleinopathy, which will have implications for pathophysiology and clinical management.

Support (if any): This study has been supported by the General Research Fund (14116119).

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0895

PHARMACOKINETICS OF PITOLISANT IN BREAST MILK AND SERUM OF HEALTHY LACTATING WOMEN

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Introduction: Pitolisant is a potent and highly selective histamine-3-receptor antagonist/inverse agonist approved for the treatment of excessive daytime sleepiness or cataplexy in adult patients with narcolepsy. A phase 4, open-label study was conducted to evaluate the pharmacokinetics (PK) of pitolisant and its major metabolite, BP1.3484, in breast milk and serum following a single dose of pitolisant administered to healthy lactating women.

Methods: In this study, eight healthy lactating women (aged 22-42 years) who met eligibility criteria were enrolled and received a single oral dose of pitolisant (35.6 mg). Serial breast milk samples were collected at pre-dose on Day 1 and at various intervals through 24 hours post-dose. Serial blood samples for PK analyses were collected at pre-dose and through 120 hours post-dose. Since the total infant dosage calculated from single dose data may be under-estimated, steady-state serum concentrations were predicted using noncompartmental methods and then multiplied by the 24-hour breast milk:serum ratio (AUCBM/S) to estimate a more appropriate total infant dose.

Results: Pitolisant was excreted in breast milk, with mean CmaxBM/S and AUCBM/S ratios of 85.2% and 123%, respectively. Concentrations of pitolisant in breast milk were only slightly lower than concentrations in serum. However, since the volume of breast milk was low, the percentage of the maternal dose expressed in breast milk was very low. Steady state calculations for a 6-month-old infant resulted in a mean total infant dosage of 0.005 mg/kg/day (SD 0.002), which is 1.15% of the maternal dose. For BP1.3484, maternal exposure and the calculated mean daily infant exposure were much lower than pitolisant. All subjects completed the study as planned. Five subjects (62.5%) reported a total of 8 treatment-emergent adverse events, which were mild in severity and resolved by end of the study.

Conclusion: Pitolisant is present in human milk, but the mean daily infant dosage in a 6-month-old infant after steady-state dosing of pitolisant in healthy lactating women was estimated to be very low. Overall, a single oral dose of pitolisant 35.6 mg was well-tolerated in healthy lactating women.

Support (if any): The study was sponsored by Harmony Biosciences LLC.

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0896**PREDICTORS OF TOTAL SLEEP DURATION IN ADULTS WITH EPILEPSY**Matthew Smith¹, Matheus Araujo¹, Noah Andrews¹, Lu Wang¹, Nancy Foldvary-Schaefer²¹ Cleveland Clinic, ² Sleep Disorders Center, Neurological Institute, Cleveland Clinic

Introduction: Sleep deprivation is a common seizure trigger in adults with epilepsy (AWE). Yet, few prospective studies explore the relationship between seizure control and sleep duration. We studied factors associated with sleep duration in AWE participating in a prospective, cross sectional study investigating prevalence of sleep disorders. We hypothesized seizure frequency would be inversely associated with sleep duration.

Methods: Participants were AWE with quantifiable seizures who completed PSG, validated instruments and seizure/sleep diaries for at least 7 days in whom prior knowledge of sleep disorder symptoms was unknown. Linear regression models were fit for Total Sleep Duration (TSD; average sleep duration during the major sleep period) and 24-hour TSD (TSD24; average sleep duration during the major sleep period + daytime naps). Independent variables were monthly seizure frequency excluding auras (MSF), monthly generalized seizure frequency (GSF), epilepsy classification (focal vs. generalized), Beck Depression Inventory (BDI) and Insomnia Severity Index (ISI) scores, age, sex, body mass index (BMI), anti-seizure medication (ASM) number and standardized dose and apnea hypopnea index (AHI). Analyses were performed based on significance level 0.05, using SAS (version 9.4, Cary, NC).

Results: The sample included 126 participants (age 37.5 (IQR:28,49), 67.5% female, BMI 28.0 (IQR:24.0,32.3), 74.6% focal epilepsy). TSD was 7.5 + 1.9hr and TSD24 7.5 + 1.9hr. Median MSF was 0.5 (IQR:0.0,4.0) with 75% having >1 seizure/mo. Median GSF was 0.75 + 9.1 with 19% having >1/mo. Median standardized ASM dose was 1.8 (IQR:0.8,2.5) and 46.8% took monotherapy. After adjustment, female sex and ISI were inversely associated with TSD (female sex -1.01, 95%CI[-1.56,-0.17]; ISI -0.09, 95%CI[-0.15,-0.02]) and TSD24 (female sex -1.44, 95%CI[-2052,-0.37]; ISI -0.09, 95%CI[-0.17,-0.01]). GSF>1 was associated with longer TSD24 than those with GSF < 1 (2.26, 95%CI[1.03,3.50] vs. 0.43, 95%CI[-0.49,1.35]). With every 1-unit increase in GSF, TSD24 increased 0.22hr (coefficient 0.22, 95%CI[0.07,0.36]). Other epilepsy-related variables were not associated with sleep duration.

Conclusion: In this first detailed analysis of TSD in AWE, female sex and higher insomnia severity were associated with shorter TSD and TSD24, and higher GSF was associated with longer TSD24. Neither TSD nor TSD24 were associated with MSF. These findings may inform future studies investigating sleep in AWE.

Support (if any):

Abstract citation ID: zsad077.0897

0897**SLEEP ARCHITECTURE AND EPILEPTIFORM DISCHARGES IN RETT SYNDROME**Katelyn Bricker¹, Bradley Vaughn², Zheng (Jane) Fan¹¹ University of North Carolina, ² University of North Carolina at Chapel Hill

Introduction: Rett syndrome (RTT) is an X-linked dominant neurodevelopmental disorder affecting females and is linked to mutations in the methyl-CpG-binding protein 2 (MeCP2) gene. Sleep issues and frequent epileptiform discharges are common in RTT. Typical comorbidities in RTT include poor growth, feeding difficulties, hyperventilation and breath-holding, seizures, scoliosis, and disrupted sleep. Although polysomnographic studies indicate sleep disruption in patients with RTT, few evaluate if the epileptiform activity is associated with significantly greater changes in sleep. We analyzed if epileptiform discharges were associated with greater sleep changes than those seen without epileptiform discharges.

Methods: This retrospective case control of 10 RTT subjects (mean age, 11.19 years; ranged from 1 to 33 years) underwent standard in-lab polysomnography (PSG) recording. Subjects were compared to 10 age and gender matched controls with an AHI < 5 and no chronic medical problems. Rett children were divided into those with epileptiform discharges and those without. The two groups were compared using binomial cutoffs for each sleep parameter, and significance was determined by Fisher's Exact Test. All studies were scored using the AASM criteria.

Results: Comparing our cohort of RTT patients to control subjects, the RTT patients have higher N3% of sleep, decreased N2%, and shorter sleep onset latency. 4 of the 10 PSGs are notable for frequent interictal epileptiform discharges. However, comparing those RTT patients with epileptiform discharges to those without, only REM latency trending shorter in those with epileptiform discharges (p= 0.057). No other significant differences were seen sleep staging, latency, total sleep time, efficiency, periodic limb movements nor respiratory parameters.

Conclusion: Our cohort did not find major differences in sleep features between those RTT patients with epileptiform discharges compared to those without. This may be related to a lack of influence of epileptiform discharges on these parameters or related to our small sample size. Although our cohort did not show major significant differences between those with epileptiform discharges, further study is required to delineate a more subtle relationship of these discharges to sleep.

Support (if any):

Abstract citation ID: zsad077.0898

0898**TITLE: TEST - RETEST RELIABILITY OF THE MULTIPLE SLEEP LATENCY TEST IN NON-CATALECTIC CENTRAL HYPERSOMNIA DISORDERS**Laura Mora-Munoz¹, Matheus Araujo¹, Noah Andrews¹, Lu Wang¹, Nancy Foldvary-Schaefer²¹ Cleveland Clinic, ² Sleep Disorders Center, Neurological Institute, Cleveland Clinic

Introduction: Differentiation of narcolepsy type II (NT2) and idiopathic hypersomnia (IH) is challenging in clinical practice.

Diagnostic criteria rely on the multiple sleep latency test (MSLT), previously shown to have poor reproducibility in these disorders. We leveraged a large polysomnographic database to study test-retest reliability in non-cataplectic central hypersomnia disorders.

Methods: Patients evaluated at Cleveland Clinic Sleep Disorders Center from 2008-2021 with suspected central hypersomnia disorders excluding narcolepsy type I with >1 PSG/MSLT were included. Studies not meeting validity criteria (< 7hr sleep time on PSG, < 5 MSLT trials, use of REM suppressants/alerting medications within 14 days) were excluded. Diagnostic groupings included NT2, IH and Normal/Indeterminate based on ICSD-3. Reliability and correlation between tests was performed using intra-class and Spearman's correlations, respectively. Data is presented as mean+SD or median [25th,75th percentiles] for continuous variables and N(%) for categorical variables.

Results: A total of 58 patients (62.1% female, age 31.9yr [18.5, 48.6]) were included. Interval between MSLTs was 3.6 + 3.18yr (same diagnosis on both tests: 3.24 + 3.15; changed diagnosis: 3.98 + 3.22). Diagnosis based on MSLT 1 was NT2 8 (13.8%), IH 20 (34.5%) and Normal/Indeterminate 30 (51.7%). Overall, 33 (56.9%) patients remained in the same diagnostic category including 3 (5.2%) NT2, 12 (20.7%) IH and 18 (31.0%) Normal/Indeterminate. Of 25 (43.1%) cases changing diagnosis, 3 (5.2%) changed from NT2 to IH and 2 (3.4%) to Normal/Indeterminate; 4 (6.9%) changed from IH to NT2 and 4 (6.9%) to Normal/Indeterminate; 5 (8.6%) changed from Normal/Indeterminate to NT2 and 7 (12.1%) to IH. Median MSL on tests 1 and 2 were 10.8 [4.6, 12.9] and 9.0 [4.5, 13.1], respectively. Correlation was moderate MSL [0.59 (0.39, 0.73), $p < 0.001$] and fair for SOREMPs [0.32 (0.07, 0.53), $p = 0.015$]. Intra-class correlation showed moderate reliability in test-retest for MSL [0.56 (0.36, 0.72)] and SOREMPs [0.54 (0.33, 0.70)].

Conclusion: MSLT test-retest reproducibility in non-cataplectic central hypersomnias was moderate in a tertiary care clinic population. While more favorable than prior studies, these findings underscore diagnostic challenges that may contribute to misdiagnosis of patients with hypersomnia.

Support (if any): None

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0899

USE OF ARTIFICIAL INTELLIGENCE FOR EARLY CHARACTERIZATION OF PATIENTS WITH RBD/RWA

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Introduction: The prevalence of polysomnography (PSG) confirmed REM sleep behavior disorder (RBD) has been estimated at 0.68% of the general population, and that of probable RBD at 5.65%. Isolated RBD is considered a pre-clinical marker of neurodegeneration with strong predictive value. Large longitudinal cohort studies demonstrate 81–91% of idiopathic RBD patients, followed for ≥14-years, will develop a definite neurodegenerative disease or mild cognitive impairment. Furthermore, high prevalence of sleep apnea (SA) exists in patients with RBD/REM without atonia (RWA), which can confound analysis of EMG tone and arousal activity. We demonstrate predictive AI models for RBD/RWA in subjects with and without SA.

Methods: Patients with known RBD/RWA who underwent PSG were divided into sub-groups with (n=86, RBD/SA) and without SA (n=19, RBD/NSA). Patient demographics, PSG

characteristics, and co-morbid conditions were reviewed. Random forest (RF) models of PSG indices and Deep Learning (DL) methods identified predictive characteristics of RBD/RWA, sensitivity and specificity for RBD/RWA detection were estimated, and feature importance analysis was performed.

Results: Subjects with RBD/SA compared to RBD/NSA demonstrated greater BMI, AHI, Arousals (ArI), and Periodic Limb Movements (PLMs). In a Parkinson's disease subgroup (n=12, RBD/DP) compared to non-Parkinson's sub-group, sleep was more fragmented, showing higher WASO, ArI, and PLMs. RF modeling demonstrated sensitivity/specificity of 67%/96% for RBD/NSA subjects, and 79%/52% for RBD/SA. Feature importance analysis resulted in several top-features for RBD/NSA: N3 time, TST, AHI, REM duration, and sleep latency, while different top-features were observed for RBD/SA: ratio of leg events in REM vs. non-REM, TST, ratio of arousals in REM vs. non-REM, REM duration, and REM time.

Conclusion: AI approaches including RF models produced high specificity and moderate sensitivity for RBD/NSA subjects. Observed specificity was lower for RBD/SA patients. We hypothesize the performance difference attributable to similarity and additional complexity in sleep disturbance characteristics between RBD and SA. Broad implementation of AI methods show potential to expand early detection and diagnosis of RBD and associated neurodegenerative conditions through expanded analysis, and follow-up, including RWA spectrum patients that don't meet clinical thresholds for diagnosable RBD.

Support (if any): None

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0900

A COMMUNITY-BASED SURVEY OF PERSONAL PERSPECTIVES REGARDING PRODROMAL SLEEP SCREENING FOR NEURODEGENERATIVE DISORDERS

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Introduction: Sleep markers can assess prodromal risk for neurodegenerative disorders (NDD). In a recent study conducted by the Mayo Clinic, most isolated REM sleep behavior disorder patients preferred knowing about their risk for parkinsonism or dementia. In their email survey, patients indicated a strong preference for disclosure of prognostic NDD risk in order to spur family discussions and plan for the future. For this pilot study, the Mayo questions were modified in order to investigate the perspectives and preferences of community-based adults about potentially being at-risk of a NDD and how it might impact their lives.

Methods: A brief survey was administered to Rotary Club attendees prior to a presentation on sleep and neurodegenerative disease. Each question offered five responses: strongly disagree, disagree, neutral, agree, or strongly agree. Personal identifiers were not obtained. Thirty-four surveys were completed from approximately equal numbers of older men and women with estimated ages above 50 years. Personal information were not obtained (e.g., age and sex).

Results: When asked whether it was important to know their NDD risk given the fact that there are no known methods to

prevent or cure the disease, most (83%) strongly agreed or agreed, while only 18% preferred not to know their NDD risk. The majority felt they would be more pessimistic about their future if identified as being at risk of NDD (62% strongly agreed/agreed). Most believed their priorities and plans for living life would change (68% strongly agreed/agreed). Further, the vast majority felt that knowing NDD risk would help them plan for the future (89% strongly agreed/agreed), including planning for health resources and support (88% strongly agreed/agreed).

Conclusion: Eighty-three percent of those surveyed reported they would benefit from knowing if they were at risk of NDD, even though the majority would feel more pessimistic about their future. The vast majority (89%) responded that knowing their NDD risk would help them plan for the future. These results suggest that most community adults might be receptive to future sleep screening for NDD with results. Investigations are underway to confirm these findings in a broader community-based study.

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0901

AN ODD PRESENTATION OF A HIDDEN CURSE

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Introduction: Congenital central hypoventilation syndrome (CCHS) is a rare disorder of respiratory deficiency due to a mutation in the PHOX2B gene. Clinical presentation may be mild in certain individuals due to different levels of ventilatory dysregulation.

Methods: We present the findings of exogenous ventilatory challenge testing and polysomnography (PSG) performed on a normocapnic adult female with late-onset (LO) CCHS patient.

Results: The patient was exposed to four separate ventilatory challenges. During exposure to hyperoxia using 100% oxygen (O₂) administration, patient showed an inconsistent ventilatory response with a blunted and delayed increase in regional tissue oxygen saturation (rSO₂). During hyperoxic hypercapnia with 5% carbon dioxide (CO₂) and 95% O₂, she demonstrated a reduced ventilatory response based on respiratory rate and tidal volume. During hypoxic hypercapnia, 7% CO₂ and 14% O₂, patient demonstrated a delayed and markedly attenuated ventilatory response. Hypoxia; 100% nitrogen inhalation did not result in increased ventilation. Ve slope, change in minute ventilation/change in end-tidal CO₂ (EtCO₂), with hypercapnia challenges was 4.88, which is lower than normal. Ventilatory EtCO₂ threshold was 36 mmHg. PSG showed apnea-hypopnea index 3.3 with hypoxemia during rapid eye movement (REM), with an oxygen saturation nadir of 84%. EtCO₂ baseline was around 36, peak was 50 and was associated with REM-related apnea events. Arterial blood gas was unremarkable.

Conclusion: CCHS is characterized by abnormal respiratory response to exogenous ventilatory challenge testing. Hyperoxia silences peripheral chemoreceptors (PC) responsible for stimulating ventilation in normal individuals. Hyperoxic hypercapnia silences PC but stimulates central chemoreceptors (CC). Hypoxic hypercapnia stimulates hyperventilation via both PC and CC. Our patient demonstrated inconsistent and reduced ventilatory responses to all four challenges. As expected, the classic chemosensory parameter, Ve slope, for hypercarbia challenge was

markedly reduced. However, the ventilatory EtCO₂ threshold fell well below threshold typically observed in CCHS. PSG noted greater alveolar hypoventilation during REM compared to non-REM, which is also atypical for CCHS. In conclusion, exogenous ventilatory challenge testing demonstrated derangements in ventilatory control typical in CCHS. Despite this, our patient had no evidence of daytime hypoventilation with normal CO₂ threshold. This case illustrates the phenotypic variability present in LO-CCHS.

Support (if any):

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0902

COMPARATIVE ANALYSIS OF SLEEP APNEA PATIENTS SELECTED FROM THE STROKE UNIT VS OUTPATIENT CLINIC

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Introduction: To our knowledge, there have been studies actively looking for patients with suspected SA in the Stroke Unit (SU), but most of them were conducted using a portable polysomnography (PSG), and no study has performed Level 1 PSG (L1PSG) to date. We conducted L1PSG to the acute stroke patients selected in the SU, and conducted L1PSG to patients who visited the Neurology Outpatient Clinic (NOC) with subjective SA symptoms at the same time. By comparison, we tried to find out the SA characteristics of acute stroke patients.

Methods: This study was conducted on patients admitted to SU from April 1, 2021 to October 31, 2022, and patients who visited NOC during the same period and underwent L1PSG. Among patients admitted to the SU, trained night shift nurses selected patients with SA symptoms with a modified mallampati score of 3 or higher. Cases under intracranial pressure control or other interventions were excluded. Outpatients were enrolled in patients who underwent L1PSG by visiting the NOC to examine only SA. The results of the pre-sleep questionnaire and L1PSG were compared.

Results: Of a total of 829 stroke patients admitted to SU, 31 SU patients received L1PSG, and during the same period, 74 patients received L1PSG for SA testing at NOC. The average age of SU and NOC was 56 and 57 years, and the median BMI was 26.9 and 26.4. In the survey, the ISI (7 vs 12, p=0.04) and PSQI (5 vs 7, p=0.021) scores were statistically significantly higher in NOC patients. As a result of the L1PSG, AHI (38.8 vs 23.1, p=0.027), AHI in Supine (59.3 vs 25.6, p=0.004) and NonREM

AHI (36.3 vs 20.9, $p=0.027$) were statistically significantly higher in SU patients.

Conclusion: Patients screened SA at SU overlooked their symptom and thought their sleep quality was better than that of NOC patients, but the actual AHI was higher. In particular, acute stroke patients show a large difference in AHI in supine compared to NOC, so lateral position can be recommended when absolute bed rest is needed in situations where SA is suspected in SU. More follow-up studies will be needed.

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0903

CPAP ADHERENCE RATE IN PATIENTS WITH ISCHEMIC STROKE

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Introduction: Although treatment of OSA in patients with ischemic stroke is important for secondary prevention of stroke and improving neurologic outcomes, patients with stroke often are not adherent to nasal CPAP. The aim of the study is to examine the adherence rate and explore the predictive factors for CPAP compliance in patients with a recent history of ischemic stroke.

Methods: We reviewed the medical records of patients with ischemic stroke who were diagnosed with OSA after the onset of stroke and those who were recommended to use nasal CPAP at a single university Hospital from March 2020 to November 2022. Demographic information, neurologic functional status, and polysomnographic data were reviewed. For patients who agreed to use CPAP, CPAP compliance data were analyzed using cloud data run by various CPAP companies.

Results: 76 patients with cerebral infarction or transient ischemic attack were diagnosed with OSA and were recommended to use nasal CPAP (mean age, 60.8 ± 12.6 , male 60). Night PSG was performed after the onset of the stroke as the evaluation process for risk factors for stroke based on clinical symptoms such as snoring or apnea. The acceptance rate for nasal CPAP was 88.1% (67/76) at the first visit after the PSG. The adherence rate was 55.2% (37/67). No difference between the adherent and non-adherent groups was found in polysomnographic variables, including AHI, RDI, and subjective sleep scales such as PSQI, ISI, and ESS. No difference in the neurologic functional deficit was found between the groups. The adherent group was younger but not statistically significant (58.4 ± 13.10 vs. 63.6 ± 11.65 , $p=0.10$). Female patients with ischemic stroke were more intolerant to CPAP (24.1% vs. 11.7%).

Conclusion: The patients in our study performed a PSG due to the risk evaluation of stroke rather than pursuing treatment for sleep apnea symptoms. Half of the patients were not adherent to CPAP, although they agreed to try CPAP. The proper screening of sleep apnea and education on sleep apnea and its impact on the neurologic outcome would be mandated to increase CPAP adherence in patients with ischemic stroke.

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0904

EXAGGERATED HYPOXIA BURDEN OF SLEEP APNEA IN PATIENTS WITH HYPERACUTE LATERAL MEDULLARY INFARCTION

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Introduction: Acute lateral medullary infarction (LMI) can sometimes appear with respiratory failure in the acute stage. Polysomnographic investigations have shown a specific association between LMI and sleep apnea syndrome. The aim of our study was to investigate this association in hyperacute stage of LMI.

Methods: We investigated 8 patients who underwent polysomnography (PSG) for sleep apnea during hyperacute stage of LMI and compared the data to 8 healthy control subjects matched according to age, sex, body-mass index (BMI), and apnea-hypopnea index (AHI). The PSG was performed within an average of 1.5 days after the onset of neurological symptoms. PSG recordings in the hyperacute phase of LMI were analyzed.

Results: Six patients were males (75%) and two were females (25%). The average age of the patients was 51.9 ± 14.5 years and the average BMI was 27.2 ± 3.5 . According to the AHI results of patients with LMI in the hyperacute phase, there were 2 (25%) cases of mild obstructive sleep apnea (OSA), 2 (25%) cases of moderate OSA, and 4 (50%) cases of severe OSA. The central sleep apnea index was higher in the patient group ($4.3 \pm 5.4/\text{hr}$) than the control group ($0.6 \pm 0.4/\text{hr}$) and was statistically significant ($p=0.035$). On the other hand, sleep parameters (obstructive sleep apnea index, respiratory arousal index, mean saturation) related to obstructive sleep apnea were poor in the control group.

Conclusion: Our study showed that sleep apnea syndrome, particularly CSA, is common in the hyperacute phase of LMI compared to control group. Early recognition of this problem and appropriate intervention may minimize the adverse effects on the respiratory system and improve the prognosis. Further and follow-up studies are needed to clarify the clinical significance and appropriate treatment options in these patients.

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0905

FACTORS ASSOCIATED WITH SLEEP QUALITY AMONG MEN WITH MULTIPLE SCLEROSIS

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Introduction: Multiple sclerosis (MS), a neurodegenerative disease with typical onset in young to middle adulthood, results in disrupted sleep more commonly than the general population. There are known sex differences in MS onset and clinical course. MS, however, affects approximately three times more women than men, resulting in less attention to the male experience. Thus, there is a lack of information on disrupted sleep among men with MS. The purpose of this study was to examine the relationships between personal factors, behaviors, and sleep quality among men with MS.

Methods: Men with MS aged 20 to 90 years participated in an online anonymous survey recruited through the National MS Society website. Pearson's correlations and linear regression were used to examine relationships between personal factors (age (years), type of MS, years since MS was diagnosed by a physician and race), sleep promoting behaviors (Sleep Behavior Self-Rating Scale), and sleep quality (Sleep Impact Short-Form total score).

Results: Four hundred ninety-six men with MS (mean age=53 years; SD=12.8; range 22-81 years) completed the survey. The majority were white (n=428; 86%) and married (n=358; 72%), with relapsing-remitting MS (n=323; 65%). Sleep quality ranged widely (mean=43.2; SD=3; range 27.9-59.9) with 90% reporting poor sleep. Pearson correlation results indicated a significant positive association between sleep quality and sleep promoting behaviors ($r=.339$) and negative associations with age ($r=-.234$) and race ($r=-.148$). Multiple regression showed that sleep promoting behaviors and age statistically significantly predicted sleep quality ($F(5,399)=15.51, p<.001, R^2=.152$). MS type, years passed since MS diagnoses and race did not add significantly to the prediction.

Conclusion: These findings suggest that poor sleep quality was strongly associated with sleep promoting behaviors among in older men with MS. Improving sleep promoting behaviors may substantially improve sleep quality. Further qualitative research is required to address the lack of information on understanding factors that disturb sleep among men with MS.

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0906

FEASIBILITY OF MEASURES OF SLEEP, CIRCADIAN TIMING AND LIPID PROFILES FOR IDENTIFYING MILD COGNITIVE IMPAIRMENT

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Introduction: Sleep disruption and circadian misalignment has been evident in patients with mild cognitive impairment (MCI). Together, sleep and circadian rhythm dysregulation can contribute to dyslipidemia, which has been proposed to play crucial roles in neurodegenerative process according to its known neurotoxicity. We aimed to compare parameters regarding lipid, nocturnal sleep and circadian timing between amnesic MCI (aMCI) and normal controls (NC), and to determine whether those parameters can be associated with the presence of aMCI in the elderly.

Methods: Participants above 50 years old were recruited from the Dementia Clinic at Kangwon National University Hospital, and

two Public Care Centers for dementia patients. Neurocognitive tests were administered to each participant. The diagnosis of aMCI was made according to Petersen's criteria. Eighteen aMCI patients (76.6 ± 6.1 years) and 21 NC (70.4 ± 6.7 years) were finally selected. Actigraphy monitoring (Actiwatch 2; Respironics, USA) was conducted for 5 days. The dim light melatonin onset (DLMO) as an indicator of circadian timing was determined from five hourly saliva samples obtained before sleep onset. Fasting plasma total cholesterol, triglycerides, high density lipoprotein cholesterol, and low density lipoprotein cholesterol were assayed. The sleep parameters, DLMO and lipid profiles were compared between the two groups. For these measures, receiver operating characteristic (ROC) analysis was performed to assess the usefulness of discriminating between the aMCI and NC.

Results: There were no significant differences in sleep parameters, DLMO and lipid profiles between the aMCI and NC groups. The bedtime and sleep onset were derived as indicators for discriminating aMCI ($p=0.003$ and $p=0.054$, respectively). The area under the ROC for bedtime was 0.861 (cut-off scores $\geq 22:02$, sensitivity= 0.76, specificity=0.75).

Conclusion: We did not reveal the usefulness of the DLMO and lipid profiles for identifying aMCI. However, we found that the bedtime had good discrimination power between aMCI and cognitively normal elderly, suggesting later sleep habits would be associated with the presence of aMCI in the elderly.

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0907

MACRO AND MICROARCHITECTURAL SLEEP FEATURES IN ALZHEIMER'S DEMENTIA AND MILD COGNITIVE IMPAIRMENT IN A LARGE CLINICAL COHORT

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Introduction: Recent work has characterized polysomnographic (PSG) changes in Alzheimer's Dementia (AD) that correlate with disease severity and precede clinical diagnosis, although these findings are limited by relatively small sample sizes and a lack of studies examining sleep microarchitecture. In this study we examined sleep macro- and microarchitectural features in large cohorts of patients with AD and mild cognitive impairment (MCI).

Methods: Using a database of over 15,000 clinical PSGs with associated clinical metadata, 125 and 173 subjects were identified with mild AD and MCI, respectively. 260 age and sex matched subjects without neurological disease were identified as healthy controls (HC). Sleep staging results were based on AASM criteria, and micro-architectural features were assessed using an algorithm (Wake EEG Similarity Index, WESI) trained to predict state using spectral data from a unique healthy adult cohort.

Results: Sleep fragmentation was apparent in both the MCI and AD cohorts (relative to healthy controls), with AD subjects demonstrating substantially more severe PSG disturbances. Healthy controls demonstrated 400 minutes of total sleep time, in contrast to 374 minutes for MCI subjects and 362 minutes for AD subjects. Healthy subjects demonstrated 33 minutes of wake after sleep onset (WASO), compared to 60 and 67 minutes for MCI and AD subjects, respectively. As has been previously reported in smaller cohorts, wakeful bouts and N1 durations were substantially prolonged for AD and (to a lesser extent) MCI subjects, while N2, N3, and REM durations were reduced (with a pronounced reduction in AD N3 percentage). Sleep microarchitectural features assessed using WESI demonstrated that AD and MCI subjects had markedly higher relative wakefulness in all sleep stages except for N3, which showed the same sleep depth as HC.

Conclusion: We confirm increased sleep fragmentation and loss of deeper sleep stages that correlate to disease severity. Spectral features of all sleep stages except N3 appear more wakeful in AD and MCI subjects, suggesting microarousals or impaired sleep maintenance contribute to sleep pathology. While N3 duration was markedly reduced, depth of sleep as measured by the WESI algorithm was comparable between populations. PSG findings offer promise as early diagnostic and therapeutic targets.

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0908

MULTI-MODAL RECRUITMENT OF INDIVIDUALS WITH REM SLEEP BEHAVIOR DISORDER INTO A LONGITUDINAL PRODROMAL PARKINSON'S STUDY

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Introduction: In 2010, The Michael J. Fox Foundation launched the Parkinson's Progression Markers Initiative (PPMI) to study how Parkinson's disease (PD) starts and changes over time. Volunteers participate in clinic, online or both. PPMI is now prioritizing recruitment of individuals with possible or probable REM sleep behavior disorder (RBD) without a PD diagnosis (goal of 500 in clinic). As 30% of people with RBD and smell loss receive a PD diagnosis within four years, RBD may provide a model to understand the evolution of the prodromal phase of PD. This presentation will describe diverse recruitment strategies utilized since 2020 to enroll individuals with RBD, to inform best practices for engaging this population in research.

Methods: A key strategy for identifying individuals with possible RBD was the dissemination of educational content on the disorder and its connection to PD. Materials emphasized that not everyone with RBD develops PD but that, in some people, RBD is an early symptom of the disease. Educational materials and messages (with associated calls to actions) were shared via webinars, print and online publications, emails, animated videos, radio, TV, and paid social media ads. Materials included scientific, participant and influencer spokespeople and were targeted to both individuals with RBD and bed partners. PPMI study sites sought referrals from sleep physicians.

Results: More than 535 individuals with a self-reported diagnosis of RBD (without PD) have enrolled in the online PPMI platform (59.4% male, 68.1% aged ≥60). Nearly 185 have been screened for site enrollment; 111 are contributing data at a study site. Foundation-led emails (16.1%) and paid social media ads (9.3%) were highest drivers to online enrollments. The most common referral sources to a PPMI RBD information and screening phone line were email (38%), social media (19%), and family/friend referral (19%). Approximately one-fourth of clinic enrollments were from physician referrals.

Conclusion: Multi-modal recruitment strategies, linked to tailored educational content, are critical for enrollment of individuals with RBD in clinical research studies including, but not limited to, those investigating and aiming to prevent other neurologic disorders.

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0909

PITOLISANT PREGNANCY REGISTRY: AN OBSERVATIONAL STUDY OF THE SAFETY OF PITOLISANT EXPOSURE IN PREGNANT WOMEN AND THEIR OFFSPRING

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Introduction: WAKIX (pitolisant) is a potent and highly selective histamine 3 receptor antagonist/inverse agonist approved for the treatment of excessive daytime sleepiness or cataplexy in adult patients with narcolepsy. The safety of pitolisant in pregnant women has not been established. Available case reports from clinical trials and postmarketing experience have not demonstrated a drug-associated risk of major birth defects, miscarriage, or adverse maternal or fetal outcomes. The registry is a prospective, observational cohort study designed to evaluate the association between pitolisant exposure during pregnancy and subsequent maternal, fetal, and infant outcomes.

Methods: The primary study population consists of 3 cohorts: pregnant women with a diagnosis of narcolepsy who are exposed to pitolisant during pregnancy, pregnant women with narcolepsy who are unexposed to pitolisant but exposed to comparator products during pregnancy, and pregnant women with narcolepsy who are neither exposed to pitolisant nor comparator products. Comparator products include modafinil, armodafinil, sodium oxybate, oxybate mixed salts, solriamfetol, methylphenidate, and amphetamines. Outcomes of interest include major congenital malformation (primary outcome), minor congenital malformation, pre-eclampsia, eclampsia, spontaneous abortion, stillbirth, elective termination, small for gestational age, preterm

birth, postnatal growth deficiency, and infant developmental deficiency. Data are collected from enrolled pregnant women and healthcare providers involved in their care or the care of their infants, if applicable. Only data that are routinely documented in patients' medical records during usual care are collected. Participation in the registry is voluntary and participants may withdraw their consent to participate at any time. The registry design follows current FDA guidance for designing and implementing pregnancy exposure registries.

Results: The registry was initiated in May 2021. Presently, data are insufficient to assess an association between pitolisant exposure and any endpoint of interest. Study completion is planned in 2030.

Conclusion: Healthcare providers are encouraged to discuss this voluntary pregnancy registry with their eligible patients and assist women who are interested in enrolling. The study is registered on Clinicaltrials.gov (ID# NCT05536011).

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0910

POTENTIAL ROLE OF PHYSICIANS IN ADDRESSING THE NEEDS OF THOSE AT-RISK OF A NEURODEGENERATIVE DISORDER – A PILOT SURVEY

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Introduction: In a recent study, most patients diagnosed with isolated REM sleep behavior disorder (iRBD) preferred their physician discussed their risk for developing a future neurodegenerative disorder (NDD) such as parkinsonism or dementia (PD). In the Mayo Clinic email survey, 75% would lose trust in their physician if PD-risk was not discussed following an iRBD diagnosis. For this survey, questions were designed to investigate preferences for how sleep physicians might communicate to community-based adults about risk of a NDD.

Methods: A survey was administered to Rotary Club attendees prior to a sleep and neurodegenerative disease presentation, with options for responses being either strongly disagree, disagree, neutral, agree, or strongly agree. Thirty-four surveys were obtained from approximately equal numbers of men and women with estimated ages above 50 years. Personal information were not obtained (i.e., sex and age).

Results: The vast majority of respondents wanted their physician to ask their preference prior to sharing NDD risk (86% strongly agreed or agreed), while virtually all would lose trust in their physician if he/she did not discuss their NDD risk (97% strongly agreed/agreed). If identified with NDD risk, responders would seek out information about medications and adaptive therapies that could delay onset (97% strongly agreed/agreed), while only about half currently had a good understanding of lifestyle patterns that might help delay onset (47% strongly agreed/agreed and 47% disagreed/strongly disagreed). Not knowing when memory problems might begin would cause most responders to feel anxious (85% strongly agreed/agreed).

Conclusion: Those surveyed wanted their physician to ask their preference prior to sharing NDD risk, but virtually all would

lose trust in their health care provider if the information was known but not shared. There appears to be a role for physicians in educating those who may be at NDD risk about interventions that could delay onset of NDD, given approximately half have a limited understanding of lifestyle patterns that could help delay onset. Further, routine follow-up for changes in prodromal NDD biomarker severity might help to reduce anxiety in the 85% of those concerned about when memory problems might begin.

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0911

SLEEP DURATION IS ASSOCIATED WITH SUBCLINICAL CAROTID PLAQUE BURDEN

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Introduction: Sleep duration is associated with stroke risk and is one of eight essential components of cardiovascular health according to the American Heart Association. As stroke disproportionately burdens Black and Hispanic populations in the United States, we hypothesized that long and short sleep duration would be associated with greater subclinical carotid atherosclerosis, a precursor of stroke, in the racially and ethnically diverse Northern Manhattan Study (NOMAS).

Methods: NOMAS is a study of community-dwelling adults that recorded self-reported nightly sleep duration and daytime sleepiness. Carotid plaque presence, total plaque area, and intima media thickness were measured by ultrasound. Linear and logistic regression models examined the cross-sectional associations of sleep duration groups (primary exposure) or daytime sleepiness (secondary exposure) with measures of carotid atherosclerosis. Models adjusted for age, sex, race/ethnicity, education, health insurance, smoking, alcohol use, physical activity, body mass index, hypertension, diabetes, hypercholesterolemia, and cardiac disease.

Results: The sample (n=1,553) had a mean age of 64.7±8.5 years and was 61.9% female, 64.8% Hispanic and 18.2% non-Hispanic Black. Of the sample, 55.6% had carotid plaque, 22.3% reported nightly short sleep (< 6 hours), 66.6% intermediate sleep (≥6 and < 9 hours), and 11.1% long sleep (≥9 hours). Compared to intermediate sleep, long sleep was associated with greater odds of carotid plaque presence (OR 1.5, 95% CI 1.1-2.2) and greater odds of plaque within the tertile of largest plaque area (OR 1.7, 95% CI 1.0-2.7), each relative to plaque absence after full covariate adjustment. Short sleep was associated with lower odds of plaque within the tertile of largest carotid plaque area but was not associated with plaque presence. Daytime sleepiness was not associated with carotid measures.

Conclusion: Subclinical carotid atherosclerosis may mediate previously observed relationships between long sleep and increased stroke risk.

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0912

STRIATAL ATROPHY AND CLINICAL CORRELATES IN REM SLEEP BEHAVIOR DISORDER

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Introduction: Idiopathic/isolated REM sleep behavior disorder (iRBD) is regarded as the most specific prodromal stage of α -synucleinopathies including Parkinson's disease (PD). Striatal dopamine dysfunction is a pathological hallmark in PD, which has been similarly reported in iRBD as a sensitive marker for detecting early α -synucleinopathies. In contrary, although there is a broad consensus that patients with PD have striatal volumes reduction, studies in iRBD are relatively scarce and inconsistent. In this study, we aim to investigate the difference of striatal nuclei volumes between iRBD and controls and their correlation with clinical presentations.

Methods: Altogether 105 patients (mean age=68.19, male 76.2%) with polysomnography-confirmed iRBD and 85 age and sex comparable controls (mean age=66.74, male 64.7%) underwent 3-tesla MRI and clinical assessments. FreeSurfer automatic segmentation pipelines measured the size of bilateral striatal nuclei including caudate, putamen, pallidum and accumbens area. The comparisons of the volume of individual striatal nucleus were made between iRBD and controls with age, sex, handedness, and total intracranial volume as covariates. Correlations were performed to investigate the association between striatal nuclei volume and clinical domains in motor (Unified Parkinson's Disease Rating Scale, Part III), cognitive (Montreal Cognitive Assessment, MoCA), visual (pareidolia), autonomic function (Scales for Outcomes in Parkinson's Disease - Autonomic Dysfunction, SCOPA-AUT) and mood symptoms (Hospital Anxiety and Depression Scale).

Results: There were smaller volumes in the bilateral putamen ($t=-2.13/-2.32$, $p=0.03/0.02$, left/right side respectively) and accumbens area ($t=-2.58/-2.07$, $p=0.01/0.04$, left/right side respectively) in iRBD comparing to controls. In addition, MoCA score was significantly positively correlated with the volumes of bilateral putamen ($r=0.212/0.213$, $p=0.032/0.033$), while pareidolia score was significantly negatively correlated with volumes of bilateral putamen ($r=-0.205/-0.233$, $p=0.039/0.018$,) and accumbens area ($r=-0.249/-0.279$, $p=0.012/0.004$, left/right respectively). The SCOPA-AUT score was significantly negatively correlated with volumes of the left putamen ($r=-0.286$, $p=0.014$) and the left accumbens area ($r=-0.245$, $p=0.037$). No other correlations with mood and motor features were found.

Conclusion: In this large case-control study, PD-like striatal atrophy was already present in patients with iRBD, which were significantly associated with worse cognitive performance, visual and autonomic dysfunction.

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0913

EVALUATION OF A SINGLE-SESSION SLEEP INTERVENTION FOR AIR FORCE TRAINEES

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Introduction: Sleep insufficiency is highly prevalent in military personnel and has detrimental impacts on operational readiness and health. Sleep health across this population does not appear to have improved despite targeted health promotion programs and efforts to bolster evidence-based tertiary care for sleep disorders. There is some evidence that problematic sleep may emerge in early military training environments and persist throughout a service member's career. Approximately 37,000 personnel complete Air Force (USAF) technical training each year to learn job-specific skills. The purpose of the present study was to assess the effectiveness of a single-session, group-based sleep intervention in USAF Technical Training.

Methods: A brief (40-min) intervention incorporating behavioral sleep medicine interventions and motivational interviewing was developed and tailored for the target population. Three military units were assigned to receive either the brief sleep intervention (n = 203) or an active control group receiving a brief tobacco intervention (n = 118). Students were queried at two weeks post-intervention to assess their sleep time and quality using the Self-Assessment of Sleep Survey-Split (SASS-Y). Participants included 321 USAF technical school students (Mean age = 21), and the majority identified as male (82%), White (67%), and non-Hispanic (75%). Propensity-score-weighted multivariable logistic regression was utilized to compare the sleep outcomes between intervention and control groups at follow-up.

Results: At follow-up, students in the sleep intervention were significantly more likely to report sleeping > 6 hours per night on weekdays (OR = 1.49, p < .001) and more likely to endorse "Good" or "Very Good" sleep quality (OR = 1.50, p = .032) as compared to the control group. Follow-up results also showed that 69.2% of students in the sleep intervention group reported having engaged in the self-selected positive sleep "Action Step" they chose and wrote down during the intervention.

Conclusion: This is, to our knowledge, the first study to design and test a brief motivational interviewing and behavioral sleep intervention in USAF technical training. Results suggest that a single-session, group-level intervention can promote behavioral changes and improve sleep health. Future efforts should consider low-touch additions (e.g., text messaging) to support the durability of intervention effects.

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0914

PERCEPTION OF SLEEP MEDICINE (SM) TRAINING AMONG INTERNAL MEDICINE (IM) TRAINEES IN PUERTO RICO

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Introduction: Awareness of the importance of SM among trainees at our IM Training Program (IMTP) has not been

documented, despite the high prevalence of Sleep Disordered Breathing (SDB) within our clinical population. Recently, the Indiana University Sleep Questionnaire (IUSQ) was administered to quantify the perception of SM in IM residents.

Methods: We administered the IUSQ questionnaire through an anonymous computer survey sample of IM residents at our ACGME accredited IMTP.

Results: A total of 52/61 (85%) residents from the Veterans Administration Caribbean Health Care System (VACHS) IMTP participated. There were 18 PGY-1, 16 PGY-2, 15 PGY-3 and 3 PGY-4 residents whom the majority strongly agreed or agreed that the burden of SDB was large in the general population (63% & 35%), that it is important for their training (48% & 46%) and for their general practice (54% & 38%). They were mostly neutral or disagreed about getting adequate training in SDB during residency (38% & 40%). The majority strongly agreed or agreed that sleep specialist is needed for managing SDB (27% & 48%) and 9.6% disagreed with this. Many do not have interest in pursuing a sleep medicine fellowship answering neutral, disagree and strongly disagree (23%, 38% & 23%). The majority strongly agree and agree that a sleep fellowship is important in treating sleep disorders (48% & 33%). The residents are mostly neutral or disagree when it comes to their confidence in treating sleep apnea (40% & 48%) and treating other sleep disorders (46% & 38%).

Conclusion: Despite the high prevalence of SDB in the population they manage, residents do not feel they are getting enough training in the management of sleep disorders. They acknowledge the importance of SM education for the latter purpose, but the majority does not want to pursue formal subspecialty training in SM. In addition, they do not feel comfortable managing SDB and other sleep disorders. Interestingly this mismatch between burden of disease and the need for disease management proficiency is similar to one found previously in a different resident population to which the same IUSQ was administered. An educational approach toward residents may further change these perceptions.

Support (if any):

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0915

COMPARISON OF IN-PERSON VERSUS TELEHEALTH POSITIVE AIRWAY PRESSURE SET UP FOR RURAL VETERANS

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Introduction: Traditionally, positive airway pressure (PAP) therapy is initiated in a face-to-face visit. This can be a barrier to

accessing care for rural Veterans. The COVID-19 pandemic led to the implementation of telehealth PAP set-ups at two large VA sleep centers providing an opportunity to assess the effectiveness of telehealth versus face-to-face PAP initiation in rural Veterans. **Methods:** We performed a retrospective cohort study of rural Veterans (defined by the Rural-Urban Commuting Areas system) to compare outcomes for those who initiated PAP with in-person visits prior to the COVID-19 pandemic to those who initiated PAP with telehealth during the COVID-19 pandemic. We assessed the days of PAP use, hours of PAP use and residual Apnea Hypopnea Index (AHI) at 30-day and 90-day intervals in these two groups. We excluded individuals who received a replacement device, and those who received PAP on or after June 14, 2021, due to a safety recall of PAP devices that may have affected use.

Results: PAP initiation data was available for 93 individuals, approximately half of whom were initiated on PAP in-person ($n=46$) and half by telehealth ($n=47$). There were no significant differences between the in-person and telehealth groups in terms of age, BMI, and AHI, which were 57.23 ± 16 vs 60.67 ± 14 (mean $\pm$ SD), 31.81 ± 5 vs 31.99 ± 13 , and 27.52 ± 23 /hr vs 28.85 ± 22 /hr respectively. The average number of days per month with PAP use at 30-day and 90-day intervals for in-person vs telehealth set-up was 17.59 ± 11 vs 15.38 ± 12 ($p=0.36$) and 15.54 ± 13 vs 14.11 ± 14 ($p=0.60$) respectively. The average number of hours of PAP use at 30-days and 90-days for in-person vs telehealth set-up was 3.25 ± 3 vs 3.11 ± 3 ($p=0.82$) and 3.15 ± 3 vs 3.07 ± 3 ($p=0.90$) respectively. The residual AHI at 30-days and 90-days for in-person vs telehealth set-up was 6.61 ± 8 /hr vs 5.25 ± 6 /hr ($p=0.37$) and 6.35 ± 8 /hr vs 7.68 ± 11 /hr ($p=0.60$).

Conclusion: In this cohort of rural Veterans, there were no significant differences in outcomes for those who initiated PAP therapy via telehealth when compared to in-person. This supports the feasibility of more widespread implementation of telehealth services for treatment of OSA in order to improve access without compromising patient outcomes.

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0916

Q4 NO MORE: OPTIMIZING CLINICAL DECISION SUPPORT TO DECREASE INPATIENT SLEEP DISRUPTIONS

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Introduction: Orders such as vital signs (VS) and neurological checks (NC) contain frequency options to help clinicians align workflows with patient needs. However, these clinical decision support (CDS) systems often default to around-the-clock, and clinicians may over-accept around-the-clock, leading to unnecessary sleep disruptions.

Methods: We added two radio buttons to VS/NC orders: q4 hour while awake (q4WA) and TID while awake (TIDWA). We gave presentations on CDS to inpatient neurology unit (INU) residents and staff pre-intervention. We sent reminders to INU residents to review and modify (when appropriate) around-the-clock orders via secure chat. We defined the pre-intervention period as six months before and the post-intervention period as six months following. Order frequencies and NC/VS performed

from 11 pm–7 am were obtained via EHR. Pre- and post-intervention data were analyzed using interrupted time-series analysis (ITSA).

Results: Post-intervention, there was a significant decrease in q4 order frequencies (VS 15% and NC 17%, $p < 0.001$) across the institution. Subgroup analysis of the INU revealed more significant reductions in q4 frequencies (VS 54% and NC 48%, $p < 0.001$). Sleep-friendly orders significantly increased for VS and NC (0% to 6.7%, 0% to 7.8%). Sub-group analysis of the INU was again more profound, with sleep-friendly orders increasing from 0% to 16% for both VS and NC. Additionally, overnight VS and NC performed decreased by 11% and 17% post-intervention ($p < 0.001$) at the institution, with a further reduction in the INU (45% and 35% decrease for VS and NC, $p < 0.001$). The case-mix index was appropriately lower in the population with while awake orders (1.2749) versus around-the-clock orders (2.2684).

Conclusion: CDS modifications significantly increased sleep-friendly orders while reducing around-the-clock order frequencies and NC/VS completed overnight. These results were more profound on the INU, indicating that a combination of CDS changes, education, and chat reminders demonstrated a higher impact than CDS changes alone.

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0917

A HYBRID COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA (CBT-I) IMPROVES ACCESS AND PATIENT ENGAGEMENT

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Introduction: Despite CBTI being the gold standard for insomnia treatment, numerous barriers need to be overcome in order for the field of sleep medicine to utilize CBTI as the front-line treatment. We investigated if a hybrid intervention combining groups, telehealth, and 1-on-1 visits would provide greater access to CBTI than the traditional model of in-person 1-on-1 sessions.

Methods: Patients receiving CBTI in 2019 (in person, 1-on-1 visits, $n=200$) were compared to patients receiving CBTI in 2021 (CBTInitiate=hybrid telehealth/in-person, group/1-on-1 visits, $n=299$). In CBTInitiate, the first 1-on-1 follow-up session was replaced by a 60-minute telehealth group session that introduced sleep psychoeducation and stimulus control followed by 1-on-1 sessions. CBTInitiate (2021) was compared with traditional-CBTI (2019) on wait times (between consultation and initial follow up session; CBTInitiate and 1-on-1 follow-up) utilizing multivariate linear regression with age as a covariate. Treatment completer status (≥ 3 visits) was also compared between groups utilizing chi-square test and two-sample t-test.

Results: Dependent variables were log-transformed to meet normality assumptions. Age significantly differed between groups (Hybrid-CBTI=55.59; traditional-CBTI=51.87; $t=2.763$, $p=.006$) and was included as a covariate. CBTI type significantly predicted wait time to first follow-up (overall: $R^2=.25$, $F(2, 496)=.83.30$, $p<.001$; $\beta=-.50$, $p<.001$). Back-transformation to estimated means show CBTInitiate patients had a shorter wait time to first follow-up ($\bar{x}=11.16$ days) than traditional-CBTI ($\bar{x}=31.24$ days). Age was not a significant predictor ($\beta=-.03$, $p=.385$). CBTI type also significantly predicted wait time from new evaluation to first 1-on-1 follow-up (overall: $R^2=.04$, $F(2, 452)=8.99$, $p<.001$; $\beta=.194$, $p<.001$). Age was not

a significant predictor ($\beta = -.06$, $p = .229$). However, CBTInitiate had a longer wait time ($\bar{x} = 38.76$ days) than traditional-CBTI ($\bar{x} = 31.27$ days) for a 1-on-1 appointment.

Conclusion: The CBTInitiate model addresses systemic, patient, and provider-level barriers to implementing CBTI as the gold-standard treatment for insomnia. The implementation of CBTInitiate significantly decreased wait times to begin CBTI and increased patients completing treatment compared to a traditional care model. Future areas for investigation include CBTInitiate's impact on healthcare costs and insomnia treatment outcomes.

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0918

ELEVATED STRESS DURING THE FIRST-YEAR OF MEDICAL SCHOOL NEGATIVELY IMPACTS SLEEP QUALITY

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Introduction: Poor sleep health is widespread within healthcare and is notoriously neglected during residency; however, little is known about sleep quality during the pre-clinical years of medical school. Stress contributes to poor sleep quality and is commonplace in medical education. This study sought to understand how stress impacts sleep among first-year medical students.

Methods: A one-time, 130-item survey was distributed to the first-year medical school class three months into the first semester. Quantitative and open-text questions sought to understand student demographics, mental health, sleep quality, and sleep-related behaviors, beliefs, and knowledge. Highly prevalent anxiety was defined as feeling nervous/anxious/on edge for more than half of the days during the previous two weeks. Odds ratios (OR) include 95% confidence intervals and were determined using binary logistic regression. Statistical significance was considered a p -value ≤ 0.05 .

Results: 138 of the 209 students (66%) in the first-year medical school class completed the survey. Demographics mirrored those of the whole class: 46% male, 54% female, and average age 23.5. Short sleep was prevalent with a mean (standard deviation) sleep time of 6.85 (0.86) hours. Additionally, more than three-quarters reported suboptimal sleep: 56% rated quality as average, and 21% rated quality as poor/very poor. 33% of respondents reported difficulty falling asleep at least once per week. A lack of restorative sleep was also common: 38% felt that sleep was rarely or never refreshing. Over half of respondents (51%) attributed poor sleep to either stress or school, and 29% of students reported elevated or highly prevalent anxiety. Elevated anxiety predicted suboptimal sleep quality (OR 14.67, 1.70-126.76, $p = 0.015$) and a lack of restorative sleep (OR 6.00, 1.52-23.71, $p = 0.011$). Similarly, suboptimal sleep quality was associated with highly prevalent anxiety (OR 44.0, 4.62-418.93, $p < 0.001$) and difficulty falling asleep (OR 4.14, 1.76-9.75, $p = 0.001$).

Conclusion: Poor sleep and stress are both prevalent during the first year of medical school, with students directly linking stress from their academic workload to impaired sleep quality and

insufficient sleep duration. Due to the pervasiveness of stress within medical education, future interventions should help students improve their sleep during both low and high stress time periods.

Support (if any):

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0919

EMR-INTEGRATED CLINICAL PATHWAY IMPROVES FAMILIARITY WITH OBESITY HYPOVENTILATION SYNDROME AMONG INPATIENT CLINICIANS

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Introduction: Obesity hypoventilation syndrome (OHS) is an underrecognized chronic respiratory condition characterized by obesity (BMI $> 30\text{kg/m}^2$) and hypoventilation ($\text{PaCO}_2 > 45\text{mmHg}$) in the absence of other causes of hypoventilation. In OHS, obesity causes mass loading on the respiratory system, leading to CO_2 retention, diminished ventilatory response, progressive hypoxia/hypercapnia, and eventual cardiopulmonary arrest. OHS is typically diagnosed while inpatient, wherein 18-month mortality approaches 23%. Non-invasive ventilation (NIV) improves OHS symptoms & prognosis which subsequently decreases healthcare utilization and mortality. With the proper tools and training, inpatient providers can facilitate accurate diagnosis and prompt treatment of OHS. Our team developed an EMR-integrated clinical pathway to increase recognition and facilitate treatment of OHS in hospitalized patients on the general medicine service.

Methods: The OHS Pathway was implemented among a large group of hospitalists at a tertiary academic medical center. A multi-disciplinary team of physicians, respiratory therapists, and care coordinators designed the pathway structure and content. Prior to integrating the OHS pathway into the EMR, hospitalists were surveyed to assess existing knowledge and experiences caring for patients with OHS. Hospitalists then participated in an educational series on OHS with orientation to the pathway. 12-months into the intervention, hospitalists were re-surveyed.

Results: Survey data analysis revealed that providers were significantly more familiar with the diagnostic criteria for OHS after ($n = 40$) the introduction of the clinical pathway rather than before the introduction ($n = 24$) of the pathway ($t(62) = 2.88$, $p = .0027$). Subjective success rates for prescribing NIV to patients upon discharge did not significantly improve.

Conclusion: OHS diagnosed in the inpatient setting carries significant morbidity and mortality. Proper detection and prompt treatment of OHS are essential to improving the care and prognosis of this high-risk population. We demonstrate that our multi-disciplinary based, EMR-integrated clinical pathway increased provider familiarity with the diagnostic criteria for OHS. While treatment success did not significantly improve, numerous systems factors were at play, and further investigations are needed to address access to treatment.

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0920

ENRICHMENT AND PATTERNS OF COMORBIDITIES IN THE ELECTRONIC HEALTH RECORD OF PATIENTS WITH DIAGNOSED OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive Sleep Apnea (OSA) is the most common respiratory disorder of sleep and an independent risk factor for multiple other medical conditions related to poor quality of life and increased mortality and morbidity. The current study utilized the electronic health record (EHR) to examine relationships between OSA and common comorbidities within a large-scale dataset.

Methods: Cases with OSA and non-cases (controls) were defined using a validated EHR case identification algorithm, and matched based on age, sex, and observation period. We collapsed International Classification of Disease codes into PheCodes representing common etiologies and identified the top 20 most common comorbidities in the EHR among cases. We then compared overall and annual prevalence between matched cases and controls using conditional logistic regression. Latent class analysis (LCA) was used to identify subtypes of cases defined by specific combinations of comorbidities.

Results: Overall, 60,586 EHR-defined cases and 60,586 matched controls (from a total of 1,226,755 EHR-defined controls) were identified. Matched pairs had a median (IQR) age of 54 (45-63) years and 57.4% were males. BMI was higher in cases (median [IQR] = 35.9 [29.6, 41.0] kg/m²) than matched controls (28.0 [24.0, 32.0] kg/m²). Patients with OSA were at significantly greater risk of having each of the top PheCodes when compared to matched controls, with odds ratios ranging from 3.1 to 30.8 in the full matched set and 1.3 to 10.2 after controlling for BMI in the subset with available data. LCA identified 5 distinct subgroups based on comorbidities, labeled as High Comorbidity Burden, Cardiovascular Comorbidities, Depressive and Inflammatory Conditions, Low Comorbidity Burden, and Obesity and Cardiometabolic Dysregulation.

Conclusion: Our study demonstrates the power of leveraging the EHR to understand the relative health burden of OSA. In addition to showing enrichment for a number of comorbidities, we identified 5 subtypes defined by specific combinations of comorbidities in the EHR. These results could be informative for understanding likely disease outcomes and improved prevention and clinical care.

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0921

INSOMNIA SYMPTOMS AND ENVIRONMENTAL DISRUPTORS: A PRELIMINARY EVALUATION OF VETERANS WITHIN A VA SUBACUTE REHABILITATION UNIT

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Introduction: Insomnia symptoms during rehabilitation admission are associated with slower rehabilitation progression, increased healthcare utilization, worse functional recovery one-month post discharge, and decreased survival rates one-year post discharge. Insomnia symptoms are complex, multifactorial (e.g., insomnia severity, sleep need, daytime sleepiness), and are often unintentionally worsened by rehabilitation admission due to environmental factors (e.g., light, noise) and behavioral factors (e.g., increased time in bed). The aim of this clinical innovation project was to conduct a preliminary evaluation of Veterans' sleep at admission and discharge in a VA subacute rehabilitation unit for the purposes of informing clinical interventions.

Methods: Veterans admitted to the VA subacute rehabilitation unit between March and August 2022 (N=67) were approached within 7 days of admission to complete a brief evaluation (Insomnia Severity Index [ISI], Sleep Need Questionnaire [SNQ], Epworth Sleepiness Scale [ESS]). Veterans also answered questions regarding environmental sleep disruptors. Following the evaluation, Veterans were offered sleep resources and behavioral treatment options. Veterans repeated the evaluation within 7 days of discharge and were offered outpatient referrals for their sleep difficulties. Pearson correlations were used to determine associations between length of stay (LOS), ISI, SNQ, and ESS scores at admission and discharge.

Results: 33 of 67 (49.2%) Veterans (Mean=73.3±8.8; 96.9% male; 78.8% white) completed admission and discharge evaluations. Over 80% of Veterans reported at least 1 environmental disruptor at admission and discharge. The number of environmental disruptors at discharge was correlated with ISI ($r = .549$, $p = .001$) and SNQ ($r = .475$, $p = .005$) scores at discharge. LOS was correlated with ESS scores at discharge ($r = .524$, $p = .002$).

Conclusion: This preliminary evaluation demonstrated relationships between higher numbers of environmental disruptors and greater insomnia severity and sleep need at discharge from a VA subacute rehabilitation unit. Additionally, longer durations of admission were associated with higher levels of daytime sleepiness at discharge. Future evaluations should include larger sample sizes to determine causality between these variables in Veteran populations. Given the impact of insomnia symptoms on rehabilitation progression, future evaluations should also consider physical function and sleep variables post-discharge.

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0922

INTERFERENCE OF RACIAL AND SOCIOECONOMIC FACTORS IN THE SLEEP OF A LARGE BRAZILIAN CITY: LESSONS FOR COMPARISONS BETWEEN COUNTRIES

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Introduction: Investigation on the effects of racial and socioeconomic parameters on sleep has markedly increased along the years. The vast majority of these studies take place on countries in North America or Europe, thus making it necessary that new initiatives are conducted in developing nations. The objective of this study was to evaluate how race and socioeconomic factors influence sleep in the city of São Paulo, Brazil.

Methods: Health and sleep parameters of participants of the EPISONO (2007) study were assessed with validated questionnaires and a night of polysomnographic examination. Data regarding their self-identified race was collected during this protocol. Among the applied questionnaires, scores in the Critério de Classificação Econômica Brasil (CCEB) questionnaire were adopted in this analysis. General Linear Models were used to investigate the relationship between objective sleep parameters and the racial and socioeconomic classification according to the CCEB questionnaire.

Results: 1,008 participants of the EPISONO were included (mean age=42.3 years; 574 women). Class C Blacks had greater total sleep time (TST) than Class A Whites, while Class C Asians presented less TST. Indigenous participants had reduced wake after sleep onset (WASO) time when sided to Whites and, similarly, Class D Blacks presented lower WASO compared to Class A Whites. Arousal index was lower in Class B and C individuals when comparing to Class A individuals and higher in Class C Blacks when compared to Class A Whites.

Conclusion: The variety of results when comparing socioeconomic and racial factors highlights the richness of the interplay between these parameters. While some findings are similar to those of North American and European studies, there are differences underlining the necessity of evaluating the socioeconomic and racial background of each population cautiously. Future research on sleep patterns of the Brazilian population concerning the effect of race and socioeconomic status is essential and a promising frontier of investigation to be explored.

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0923

POOR SLEEP HYGIENE IS WIDESPREAD AMONG FIRST-YEAR MEDICAL STUDENTS

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Introduction: Poor sleep health is widespread within healthcare and is notoriously neglected during residency; however, little is known about sleep quality during the pre-clinical years of medical school. Sleep hygiene is broadly defined as the sleep-adjacent behaviors and beliefs that significantly contribute to sleep quality. This study sought to determine the prevalence of various sleep hygiene related behaviors among first-year medical students.

Methods: A one-time, 130-item survey was distributed to the first-year medical school class three months into the first semester. Quantitative and open-text questions sought to understand student demographics, mental health, sleep quality, and sleep-related behaviors, beliefs, and knowledge. Mean bedtimes were grouped based on when students drank their last caffeinated beverage and compared using one-way analysis of variance (ANOVA) with the Turkey HSD test. Statistical significance was considered a p-value ≤ 0.05 .

Results: 138 of the 209 person (66%) first-year medical school class completed the survey. Demographics mirrored those of the whole class: 46% male, 54% female, and average age 23.5. While only 15% of students reported pulling an all-nighter (obtaining less than 2 hours of sleep over 24 hours) during the current academic year, many other behaviors associated with poor sleep hygiene were prevalent. Large proportions of students reported using social media (78%), texting (68%), watching television (41%), and thinking (53%) in bed more than three times per week. Caffeine use was also high. Only 12 respondents (8.7%) reported never consuming caffeinated products, while just over 50% consumed caffeine at least once per day. Furthermore, of the 126 students who reported caffeine use at least once per month, 74 (59%) drank their last caffeinated beverage after 2:00 p.m. Intriguingly, average weekday bedtimes did not differ based on when students consumed their last caffeinated beverage ($p=0.059$), suggesting that caffeine consumption is driven by factors other than predicted bedtime.

Conclusion: Poor sleep hygiene is widespread among first-year medical students. Future interventions should seek to increase awareness among medical students about sleep hygiene and its importance while providing them with feasible tips for how to incorporate them into their lives.

Support (if any):

Abstract citation ID: zsad077.0924

0924**POOR SLEEP REGULARITY IS WIDESPREAD AMONG FIRST-YEAR MEDICAL STUDENTS**Matthew Marquardt¹, Fielding Fisher², Michael Grandner³, Meena Khan⁴¹ The Ohio State University College of Medicine, ² The Ohio State University Wexner Medical Center, ³ Sleep & Health Research Program, Behavioral Sleep Medicine Clinic, University of Arizona College of Medicine, ⁴ The Ohio State University

Introduction: Poor sleep health is widespread within healthcare and is notoriously neglected during residency; however, little is known about sleep quality during the pre-clinical years of medical school. Sleep regularity is increasingly recognized as a key driver for sleep quality and health. This study sought to determine the prevalence of and the factors that contribute to irregular sleep among first-year medical students.

Methods: A one-time, 130-item survey was distributed to the first year medical school class three months into the first semester. Quantitative and open-text questions asked about various sleep health related topics, including sleep regularity across weekdays (WDs) and weekends (WEs) for the past two weeks. Likert scale responses were treated as continuous data and reported as mean $\pm$ standard deviation. Means for WD and WE times were compared using paired t-tests. Statistical significance was considered a p-value ≤ 0.05 .

Results: Out of 209 medical students in the first-year class, 58% (n=121) completed the sleep irregularity items on the survey. Demographics mirrored those of the whole class: 46% male, 54% female, and average age 23.5. The differences between WD and WE times for getting into bed (1.03 ± 0.90 hours), falling asleep (0.92 ± 0.80 hours), waking up (1.62 ± 0.84 hours), and getting out of bed (1.89 ± 0.93 hours) were significant ($p < 0.001$). Furthermore, 49.3% of participants reported significant bedtime or wake time variability (>3 hours difference from one day to another) at least once per week during the past 3 months. This occurred despite respondents expressing a strong belief in the importance of sleep consistency (7.1 ± 2.25 on a 10-point Likert scale; 0=Strongly Disagree, 5=Neutral, 10=Strongly Agree).

Conclusion: Poor sleep regularity is widespread during the first year of medical school. While students are aware of the importance of consistent bedtimes and wake times, they rarely follow this knowledge suggesting that external factors encountered during medical school such as poorly balanced academic workloads or stress might be to blame. Future studies should seek to better understand the factors contributing to poor sleep regularity in medical school and develop interventions to help students address any barriers.

Support (if any):

Abstract citation ID: zsad077.0925

0925**POPULATION HEALTH AND DATA ANALYTICS AS AN OPPORTUNITY FOR IMPROVING CARE QUALITY IN SLEEP MEDICINE**Ellen Stothard¹, Mark Hickey¹, Adam Wertz¹¹ Colorado Sleep Institute

Introduction: The volume and diversity of sleep-related and quality of life complaints in sleep medicine has increased

through improved availability of data from wearables and public education on sleep health. Future shifts away from quantity and towards quality-based compensation by insurance payors will require practices to understand and actively monitor population health and outcomes data and implement data-driven practices to improve diagnostic efficiency. Currently, prevalence and population health data benchmarks are incomplete or absent in many aspects of sleep disorders treatment. The integrated care model of sleep medicine, with board-certified primary sleep physicians, an in-house Positive Airway Pressure (PAP) Therapy clinic and certified sleep medicine Dentist, is uniquely positioned to improve care by characterizing the impact of clinical decision-making on care cost and quality.

Methods: Population health data was gathered in the course of patient care in the integrated care model. Baseline/Diagnostic Home Sleep Apnea Test (HSAT) results from 2018-2021 were included. Diagnostic severity was categorized based on AASM treatment guidelines. Matched therapy visits were included from PAP Therapy Initiation or Compliance visit and treatment outcomes, as well as non-PAP treatments for sleep-disordered breathing, Oral Appliance (OA) and Inspire Therapy.

Results: 20% of 8531 Diagnostic HSAT results were non-diagnostic for sleep apnea, 35% were Mild, 21% Moderate and 24% Severe. Of non-diagnostic tests, 81% had no sleep apnea treatment associated. Of Mild diagnostic tests, 49% had associated PAP initiation or compliance, 9% had associated OA, and 42% had no treatment associated. The relationship between diagnostic severity and associated treatment was significant ($X^2 < 0.0001$). Further, Moderate and Severe resulting diagnostic tests had no associated treatment in 24% and 28% of cases, respectively.

Conclusion: Sleep medicine patients are commonly symptomatic and often have major quality of life complaints. Yet as these data demonstrate, there is a substantial proportion of patients who do not have an associated treatment after a positive diagnostic home sleep apnea test. Future studies should include additional demographic and follow up data to better understand care pathways both for patients who receive a positive diagnostic test but pursue alternative treatment methods, as well as more complicated non-diagnostic sleep disorders patients.

Support (if any):

Abstract citation ID: zsad077.0926

0926**TEACHING MEDICAL STUDENTS ABOUT INSOMNIA: EARLY RESULTS OF A BRIEF LECTURE FOR THIRD YEAR MEDICAL STUDENTS**Andrew Tubbs¹, Jordan Karp¹, Sairam Parthasarathy², Michael Perlis³, Michael Grandner⁴¹ University of Arizona College of Medicine - Tucson, ² University of Arizona, ³ Behavioral Sleep Medicine Program, University of Pennsylvania, ⁴ Sleep & Health Research Program, Behavioral Sleep Medicine Clinic, University of Arizona College of Medicine

Introduction: Insomnia affects 10 to 20 percent of Americans annually. Unfortunately, evidence-based training on the diagnosis and management of insomnia during U.S. undergraduate medical education is limited. This educational gap may promote use of off-label medications or supplements (e.g., melatonin) and contribute to the “medicalization of sleeplessness”. By contrast, cognitive behavioral therapy for insomnia (CBT-I) is the first-line recommendation of the American Academy of Sleep Medicine and the American College of Physicians, and CBT-I

is increasingly available in a digital format that can even be prescribed by primary care providers. Most physicians are not trained in how CBT-I works, however, and thus are ill-equipped to prescribe or refer this service. Therefore, this pilot study evaluated a brief educational intervention to improve medical student knowledge about insomnia.

Methods: The first author (AST) developed a 20-minute in-person lecture on insomnia which was delivered to 122 undergraduate medical students during their third-year medical curriculum. Topics included epidemiology, Spielman's 3-P model of pathophysiology, and the treatment recommendations from the AASM with an emphasis on CBT-I. A total of 43 students (36%) provided informed consent and provided pre- and post-presentation ratings (0–100-point scale) of 1) their comfort in discussing insomnia with their patients, 2) the importance of insomnia for human health, 3) their familiarity with the pathophysiology of insomnia, and 4) their familiarity with treatments for insomnia. Participants were additionally asked to categorize a list of treatments as evidence-based or not.

Results: Following the presentation, students reported increased comfort in discussing insomnia with their patients, knowledge of the pathophysiology of insomnia, and knowledge of evidence-based treatments. In selecting treatments, more students chose CBT-I as an evidence-based treatment, while fewer students identified sleep hygiene, PAP therapy, diphenhydramine, hydroxyzine, melatonin, quetiapine, and trazodone.

Conclusion: A brief lecture on insomnia improved medical students' knowledge of the disease process and evidence-based treatments for insomnia. Forthcoming analyses will determine whether students utilized this knowledge during subsequent clerkships. Future work will examine whether alternative formats (e.g., flipped-class, case-based instruction, interactive modules) are more effective for conveying this information.

Support (if any):

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0927

THE EVOLUTION OF COSTS FOR TELEHEALTH VERSUS IN-PERSON PAP INITIATION FOR PATIENTS WITH SLEEP APNEA OVER THE COVID PANDEMIC

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Introduction: During the COVID pandemic, at the San Francisco VA Healthcare System (VASFHS), positive airway pressure (PAP) set-up visits transitioned from in person to a mix of in person and telehealth for patients newly diagnosed sleep apnea. As part of a larger study examining the clinical outcomes resulting from telehealth versus in-person PAP initiation, we performed a cost analysis of these two treatment pathways within VASFHS.

Methods: The telehealth pathway included mailing of PAP machines to patients (initially from VASFHS and later through a centralized national distributor), with follow-up video/phone education by respiratory therapists (RTs) and registered sleep technicians (RSTs). We used a bottom-up analysis to examine the total variable direct cost of telehealth versus in-person PAP initiation at various points through the COVID pandemic for patients newly diagnosed with sleep apnea at VASFHS.

Results: The total variable direct cost of telehealth PAP initiation was \$49.66 per patient mid-pandemic (Feb-Dec 2020) compared to \$31.02 per patient post-pandemic (Oct-Dec 2022). The total variable direct cost of in-person PAP initiation was \$16.76 per patient pre-pandemic (Jan-Dec 2019) compared to \$22.71 per patient post-pandemic. The reduction in costs (37.5%) for telehealth PAP initiation mid- to post-pandemic was due to 25% less RT/RST time required and elimination of PAP shipping costs as PAP distribution became nationally centralized. The increase in costs (35.5%) for in-person PAP initiation pre- to post-pandemic was largely due to elimination of group PAP initiation sessions (33.3% more RT/RST time required for individual PAP initiation). Post-pandemic, telehealth PAP initiation cost was 36.6% more than in-person due to 25% more RT/RST time required and five times as much troubleshooting help required for the telehealth pathway.

Conclusion: With integration of telehealth for PAP initiation, as RT/RSTs gained more expertise with this interface through the pandemic and as distribution of PAP machines/supplies became centralized, costs were significantly reduced, making telehealth a financially sustainable workflow. Future cost analysis can evaluate if group rather than individual telehealth PAP initiation would yield additional cost savings, placing it on par with the cost of in-person PAP initiation.

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0928

THE SELF-REPORTED PRACTICE OF LIGHT EXPOSURE RECOMMENDATIONS IN THE MORNING, DAYTIME, EVENING, AND NIGHTTIME

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Introduction: While it is well known that ocular light strongly entrains the central circadian clock, there has been a lack of evidence-based recommendations for daytime, evening, and nighttime light exposure for healthy adults. Recently, an expert consensus report with recommendations for light exposure has been published. Although the general population is likely not yet acquainted with these recommendations, we examined the self-reported practice of daily and nightly light exposure based on these published guidelines.

Methods: Online survey data were collected from 168 participants through convenience sampling (age range: 25-80, mean age: 58.9 + 12.6 years, 55% female). The practice of expert, consensus-based light recommendations was assessed with 4 items on an 8-point frequency scale ranging from "Never" to "Every day of the week". The scale covered 1) indoor daytime light recommendations, 2) indoor evening light recommendations, 3) nighttime light recommendations for the sleep environment, and 4) an additional morning-specific question.

Results: Within the first hour after waking up, the majority of respondents (53%) reported never receiving exposure to at least 15 minutes of sunlight or simulated bright light, with only 16% reporting exposure every day of the week. Throughout the daytime, 54% of respondents reported receiving consistent natural indoor light or sunlight every day of the week, and 8% reported never receiving any. During the evening, 47% of respondents reported never dimming lights and avoiding bright light starting at least 3 hours before bedtime. However, 24% reported avoiding bright light sources before bedtime every day of the week. While sleeping, nearly 80% of respondents reported keeping their bedroom as dark as possible, no brighter than natural moonlight, every day of the week, with only 10% reporting never doing so.

Conclusion: Self-reported practice of recently published light recommendations was poor for both morning and evening light exposure. These findings suggest that sleep and circadian health campaigns should focus on the importance of bright light in the morning upon awakening, and of dimmed light in the late evening before bedtime.

Support (if any): SleepScore Labs

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0929

THE SOCIAL DETERMINANTS OF HEALTH AND SLEEP HEALTH: A LATENT CLASS ANALYSIS

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Introduction: Social determinants of health (SDOH) have been linked to well-being, quality-of-life and health disparities. We aim to investigate, 1) To classify adults based on their SDOH characteristics, and 2) To examine association between SDOH classes and sleep health.

Methods: This study used 2020 National Health Interview Survey data (n=31,568). SDOH was captured by health insurance, well-visits, delayed medical care, neighborhood walkability, social support, food insecurity, food stamp, poverty, and education. Sleep health was captured by: 1) Sleep quantity (hours): very short (< 5), short (5-6), normal (7-8), and long (≥9); 2) Sleep quality: trouble falling asleep or staying asleep; 3) Sleep medication, 4) Feeling well-rested, and 5) Fatigue. Latent class analysis generated a 3-class model with a gradient on all SDOH characteristics. Generalized structural equation modeling was used to examine associations between adverse SDOH classes and sleep health, with Class 1 (lowest probability of adverse SDOH), as reference category.

Results: Adults in Class 3 were 36% more likely to have short sleep than normal sleep. Classes 2 and 3 were 16% and 24% more likely to have trouble falling asleep on “some days”; 26% and 40% more likely on “most days”; and 28% and 77% more likely every day than never. Classes 2 and 3 were 22% and 23% more likely to have trouble staying asleep on “some days”; 36% and 35% more likely on “most days”; and 48% and 77% more likely every day than never. Class 2 was 19% more likely to take sleep medications on “some days” and 25% more likely every day than never. Classes 2 and 3 were 26% and 86% more likely to never

feel well-rested; 30% and 60% more likely to feel well-rested on “some days” than every day. Classes 2 and 3 were 17% and 49% more likely to feel fatigued on “some days”; 43% and 99% more likely on “most days”; 55% and twice as likely to feel fatigued every day than never.

Conclusion: Adverse SDOH are associated with worsened unhealthy sleep. Further research is needed for the implementation of interventions to improve sleep health among marginalized groups more impacted by adverse SDOH.

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0930

WHAT EXPLAINS HIGH SELF-REPORTS OF POOR SLEEP QUALITY IN NATIVE HAWAIIAN/PACIFIC ISLANDERS?

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Introduction: High rates of poor sleep quality have been reported among patients of Native Hawaiian/Pacific Islander (NHPI) race. Unrestful sleep might be attributable to short sleep times or to elevated rates of obstructive sleep apnea among NHPIs. We aimed to evaluate factors associated with self-reported poor sleep quality among NHPIs in a nationwide, representative community sample.

Methods: Using the 2014 National Health Interview Survey (NHIS), we used logistic regression to model the odds of individuals reporting that they did not awake feeling rested at least two out of the prior seven days. NHPIs from the NHPI-NHIS and non-NHPIs from the general sample were compared. Age, sex, BMI, smoking status, report of heavy drinking, employment status, marital status, and reported average hours of sleep time were evaluated in terms of their effects on self-reported sleep quality.

Results: Data from 36,697 non-NHPI and 2,590 NHPI individuals was available for analysis. There were significant differences in age, BMI, marital and current employment status between NHPIs vs. non-NHPIs. NHPI patients reported less sleep (mean 6.86±1.41 hours) in contrast to non-NHPIs (mean 7.12±1.42 hours) (P< 0.001). NHPIs were more likely to report two or more days awakening not feeling rested (Odds Ratio (OR) 1.22, 95% confidence interval (95CI) 1.12–1.32) as compared to non-NHPIs. After adjusting for demographics, BMI, alcohol, smoking, and marital and employment status, the relationship persisted (OR 1.17, 95CI 1.07-1.28). When additionally controlling for sleep time, which was strongly associated with the likelihood of awakening unrested (OR 3.1 95CI 2.9-3.2 for six or fewer average hours of sleep), there was no significant relationship between race and likelihood of awakening unrested (OR 1.02, 95CI 0.93-1.13). Findings were similar when evaluating different thresholds of unrestful nights per week.

Conclusion: NHPIs are more likely to awake feeling unrested than non-NHPIs. The higher rate of unrestful sleep is associated with higher reports of short (6 hours or less) sleep time. Therefore, future research to improve sleep quality in NHPIs should also investigate the cultural and social factors leading to short sleep time.

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0931**APP-SUPPORTED SLEEP COACHING: IMPLICATIONS FOR SLEEP DURATION AND SLEEP QUALITY**Michael Grandner¹, Suzanne Gorovoy²¹ Sleep & Health Research Program, Behavioral Sleep Medicine Clinic, University of Arizona College of Medicine, ² University of Arizona College of Medicine**Introduction:** Sleep coaching programs have emerged to address sleep health needs for subclinical populations. Yet, few such programs have been formally evaluated.**Methods:** Data were obtained from N=51 consecutive users who completed the 12-week Sleep Reset program. Sleep Reset (Simple Habit, Inc.) includes ongoing text-based communication with trained coaches and a mobile app that includes a sleep diary, educational modules, mindfulness exercises, and progress-tracking. Potential users with a contraindicated medical/psychiatric problem or a likely sleep disorder (including Insomnia Disorder) are referred for additional care/support. The coaching included information about sleep and circadian principles (e.g., sleep hygiene, behavioral scheduling, light exposure, relaxation) and techniques based on CBTi (e.g., stimulus control). T-tests examined change scores for diary-derived sleep latency (SL), wake after sleep onset (WASO), total sleep time (TST), number of awakenings (NWAK), and sleep efficiency (SE). N=3 had uninterpretable baseline TST. Post-hoc analyses examined those who reported at least one sleep continuity disturbance (SL $\geq$ 30, WASO $\geq$ 30, SE $<$ 0.85; N=44) vs none (N=7) and short sleepers (TST $<$ 360 min; N=19) vs 6+ hours (N=32).**Results:** Those who participated in the program saw a mean increase in SE of 6.4% (95%CI [2.7%, 10.2%], t(50)=3.4, p=0.001) and TST of 57.8 mins (95%CI [33.8, 81.8], t(47)=4.9, p< 0.0005), and a mean decrease in SL of 12.2 mins (95%CI [-20.0, -4.4], t(50)=-3.1, p=0.003), WASO of 32.4 mins (95%CI [-52.7, -12.0], t(50)=-3.2, p=0.002), and NWAK of 0.3 awakenings (95%CI [-0.7, -0.01], t(50)=-2.1, p=0.046). Those who reported a problem were more likely to show an improvement in SE (+7.9% vs -0.3%, p=0.001), SL (-14.8 vs +4.0 mins, p=0.0008), and WASO (-40.5 vs +15.8 mins, p=0.0001), but groups did not differ in terms of change in NWAK and TST. Short sleepers saw a relative improvement in SE (+12.2% vs +3.0%, p=0.037) and TST (+109.8 vs +23.7 mins, p=0.0001), but no differences in change to SL, WASO, and NWAK.**Conclusion:** The sleep coaching program improved sleep quality and duration for participants without sleep disorders. Those with baseline sleep continuity problems received the most benefit to SL and WASO, and short sleepers saw a nearly 2-hour average increase in TST. Future studies need to extend this work with control groups.**Support (if any):**

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0932**SLEEP DIFFICULTIES: PREVALENCE, RELATIONSHIP WITH PSYCHOLOGICAL OUTCOMES, AND INTERINDIVIDUAL DIFFERENCES IN STUDENT-ATHLETES**Jonathan Charest¹, Jesse Cook², Penny Werthner³, Charles Samuels¹¹ Centre for Sleep & Human Performance, ² University of Madison-Wisconsin, ³ University of Calgary**Introduction:** Mental health issues are a leading cause of decreased academic and athletic performances when left untreated. Recently, the International Olympic Committee (IOC) and the National Collegiate Athletic Association (NCAA) have highlighted the fundamental importance of mental health among young athletes. Sleep represents a core feature of mental health, and student-athletes represent a vulnerable population for sleep restriction and disruption due to the demands of their course load and training schedule. This investigation was performed to identify differences in sleep and mental health across gender, race/ethnicity, and sport type.**Methods:** Data were obtained throughout the academic semester from Canadian institutions, with student-athletes completing the Athlete Sleep Screening Questionnaire (ASSQ), General Anxiety Disorder-7 (GAD-7), and Patient Health Questionnaire (PHQ-9). ASSQ captured sleep and circadian health, while GAD-7 and PHQ-9 assessed anxiety and depressive symptoms, respectively. Linear regression determined gender, race/ethnicity, and sport type differences across ASSQ sleep problems score, ASSQ sleep items, GAD-7 score, PHQ-9 score, and PHQ-9 item #9 (suicidal ideation).**Results:** Final sample (N=559) was 53.0% female, 79.1% white, comprised of young individual (Mean Age = 18.9 $\pm$ 3.21), and included student-athletes from basketball, field-hockey, football, ice-hockey, soccer, volleyball, track & field and swimming. Females reported more overall sleep difficulties (p=0.01), medication use (p=0.04) and WASO (p=0.001) compared to males. Females also reported higher anxiety (p < 0.0001), depression (p < 0.0001), and suicidal ideation (p=0.03). Significant variance in total sleep time (TST) (p=0.001) and sleep satisfaction (p=0.04) was observed across race/ethnicity, with student-athletes identifying as Black or African American reporting the lowest TST, while Asian or Pacific Islander student-athletes reported the lowest sleep satisfaction. Significant variance in sleep difficulties score (p < 0.0001), TST (p < 0.0001), and satisfaction (p < 0.0001), as well as anxiety (p < 0.0001) and depression (p < 0.0001) was observed across sport type. Football student-athletes reported the highest sleep difficulties score, and lowest TST satisfaction. Field-hockey student-athletes reported the highest anxiety and depression.**Conclusion:** Results suggest that sleep and mental health challenges present differently across gender, race/ethnicity, and sport type. Clarifying these unique and specific challenges to student-athlete sleep and mental health is necessary to enhance and personalize interventions.**Support (if any):** Mitacs #IT23469

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0933**SLEEP SPECIALISTS IN FEDERALLY QUALIFIED HEALTH CENTERS: A GAP IN SLEEP HEALTH CARE POTENTIALLY CONTRIBUTING TO SLEEP DISPARITIES**Rupsha Singh¹, Paul Juarez², Susan Redline³, Anna Nápoles¹, Chandra Jackson⁴¹ National Institute on Minority Health and Health Disparities, NIH, ² University of Tennessee Health Science Center, ³ Division of Sleep Medicine, Harvard Medical School, ⁴ National Institute of Environmental Health Sciences**Introduction:** Poor sleep is associated with adverse cardiometabolic health outcomes and increased risk of mortality. Although primary care providers recognize the importance of sleep, they

report low comfort levels in diagnosing, treating, and managing sleep disorders; lack of clinical knowledge and skills is the most common barrier to recognizing insomnia in family practice. Furthermore, minoritized racial/ethnic groups are disproportionately affected by poor sleep health, likely due in part to structural and other forms of racism that result in limited access to sleep healthcare. Health Resources & Services Administration (HRSA) has a variety of awards that support scholarships and loan repayment programs at colleges and universities to meet critical workforce shortages and diversify the health professions. We assessed the distribution of sleep specialists among clinicians who participated in a HRSA grant program because they tend to work for health care organizations that serve persons from lower socioeconomic and diverse racial-ethnic backgrounds.

Methods: Publicly available data were obtained from the HRSA data warehouse. Data were available for 44,199 clinicians (49% MD/DO and 16% Nurse Practitioner) who participated in a HRSA grant program between 2011 and 2021. We report data for those clinicians who endorsed sleep medicine as their subspecialty.

Results: Of the 44,199 clinicians, 27 (0.06%) physicians trained in a medical subspecialty of sleep medicine, and the majority (52%) were in Michigan. The remainder of sleep medicine specialists completed their program in Pennsylvania (33%), Ohio (7%), Minnesota (4%), and California (4%). Only the participants in the Children's Hospital Graduate Medical Education program designated their subspecialty as sleep medicine. None of the sleep medicine specialists currently practice in Health Professional Shortage Areas (HPSAs) or Medically Underserved Areas/Populations (MUA/P), and 1 physician currently practices in a rural area.

Conclusion: A marked paucity of trained sleep specialists in HRSA grant programs and an absence of such practitioners in HSPAs underscores the disparities in access to sleep specialty care. Initiatives are needed to incentivize sleep specialists to serve in under-resourced communities as well as to implement programs training primary care practitioners working in these areas to deliver sleep health care, supported by sleep specialists.

Support (if any): Divisions of Intramural Research: NIMHD/NIEHS, NIH

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0934

AN ANALYSIS OF 5,212 SLEEP MEDICINE PROVIDERS' ONLINE PATIENT REVIEWS

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Introduction: Online provider rating websites are an increasingly popular medium for patients to provide reviews & feedback and obtain information about varying healthcare providers. There have yet to be studies on what factors significantly impact sleep medicine provider ratings. Healthgrades is a popular healthcare provider rating database with over 11 million patient reviews. This study analyzes various dimensions to determine what factors correlate with average sleep medicine provider ratings to improve patient satisfaction.

Methods: Data were collected on 5,212 sleep medicine providers' online profiles using web data extraction software. Factors such as medical degree, gender, age, and ethnicity were compared to online ratings using Pearson correlation and ANOVA analysis via statistics software.

Results: Variables with positive correlation in provider rating include the presence of a headshot ($p=0.106$, $p<0.01$), designation of trustworthiness ($p=0.152$, $p<0.01$), and presence of care philosophy statement ($p=0.105$, $p<0.01$). The only variable with a negative correlation in provider rating was increasing age ($p=-0.109$, $p<0.01$). A one-way ANOVA revealed that there was a statistically significant difference in mean rating between different healthcare degrees ($F(122,271, 5062.570)=[17.955]$, $p<.001$). Tukey's HSD Test for multiple comparisons found that the mean value of ratings was significantly different between allopathic physicians and sleep medicine dentists ($p=0.000$, 95% C.I.=[-0.943,0.070]), physician assistants ($p=0.000$, 95% C.I.=[-1.268,-0.239]), and nurse practitioners ($p=0.000$, 95% C.I.=[-0.941,-0.188]). There was no statistically significant difference in mean online rating between allopathic physicians and osteopathic physicians ($p=0.505$), sleep psychologists ($p=0.344$), or foreign medical graduates ($p=0.998$), respectively.

Conclusion: This study suggests patients perceive sleep medicine providers' online profiles with headshots, care philosophy statements, and designation of trustworthiness as contributing factors when rating. Additionally, degree type and age matter when rating online. Patients do not value factors such as ethnicity or gender strongly when rating their sleep medicine provider. Further study is needed to determine factors influencing non-physician providers' higher ratings when compared to U.S. medical graduates. This study demonstrates the importance of building an online presence for sleep medicine practices and identifying characteristics patients value. The expectation is that this information can be used to improve the quality of care delivered in the field of sleep medicine.

Support (if any):

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0935

AN INVESTIGATION OF ICU AMBIENT NOISE LEVELS AS A POTENTIAL SOURCE FOR POOR SLEEP OUTCOMES IN A COMMUNITY HOSPITAL SETTING

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Introduction: Patients in the intensive care unit (ICU) are subject to multiple necessary diagnostic and therapeutic interventions throughout the course of their treatment that contribute to sleep deprivation. These measures increase ambient noise, impacting patient morbidity and mortality by exacerbating confusion, ICU-related delirium, recovery time, and long term sequelae associated with Post-Intensive Care Syndrome. The World Health Organization suggests critically-ill patients not exceed exposure to sound levels higher than 35-40 decibels (dB). In this study, we measured ICU sound levels in a community hospital setting to support intervention with conservative bundle measures or behavior modification with a visual noise monitoring device.

Methods: This study took place over two months (October-November, 2021) in the critical care unit of St Agnes Medical Center in Fresno, CA. Ambient noise was monitored using a sound decibel meter (Gain Express Holdings, SLM-25) connected to recording software that measured the decibel levels at 1-minute intervals for 24 hours in three areas: two central stations (Station A and B) and one occupied patient room, equidistant to both central stations. The monitor data was exported to Microsoft Excel (2020 version; Microsoft Corp, Redmond, WA, USA) for analysis. Data from each sample was expressed as $M \pm SE$ (95% confidence interval).

Results: Both central stations had average levels of $44.1\text{dB} \pm 4.7$ and $48.0\text{dB} \pm 4.3$, with a frequency range of 40-50 dB greater than 50% of the time. Station A had a frequency range of 50-60 dB approximately 11% of the time and Station B at 30% of the time. The occupied patient room had average levels of $48.0\text{dB} \pm 5.4$, with frequency of 40-50 dB greater than 50%, and levels 50-60 dB greater than 30% of the time.

Conclusion: ICU's with higher than recommended ambient sound levels may benefit from appropriate intervention such as visual noise monitoring devices or order-sets with protocols on equipment/staff phone volume, earplugs for patients, and limiting staff conversation to distances away from the bedside.

Support (if any):

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0936

CHARACTERISTICS AND PREDICTORS OF PRESCRIPTION SLEEP MEDICATION USE IN A NATIONAL SAMPLE OF VETERANS WITH CHRONIC PAIN

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Introduction: Insomnia and other sleep problems commonly occur in patients with chronic pain. While behavioral approaches are recommended first-line treatments for conditions such as insomnia, patients with sleep complaints often receive sleep medications. Thus, we aim to understand patterns of prescription sleep medication use in Veterans with chronic pain receiving care at the Veterans Health Administration (VHA).

Methods: We reviewed electronic medical records to identify patients with moderate/severe chronic pain receiving care at a VA hospital between FY2019–2021. Multivariate logistic regressions examined associations between 14 patient demographic and clinical variables on sleep medication prescription. Short-term prescriptions associated with upcoming procedures were excluded.

Results: Of the 1,706,214 moderate/severe patients with chronic pain (88% male, 66% White), 14% had comorbid diagnosis of insomnia, 30% sleep disordered breathing, and 19% were prescribed sleep medications. Trazodone (40%), melatonin (23%), and benzodiazepines (14%) were most commonly prescribed. Although 14% of patients without insomnia or sleep apnea diagnostic codes were prescribed medication, patients with insomnia were four times more likely to use sleep medication (odds ratio (OR) = 4.05, 95% CI [4.01-4.09]). Strongest predictors of medication use were insomnia (adjusted OR = 2.84, 95% CI [2.81-2.86]), PTSD (adjusted OR = 2.77, 95% CI [2.75-2.79]), depression (adjusted OR = 1.89, 95% CI [1.87-1.91]), bipolar disorder (adjusted OR = 1.84, 95% CI [1.81-1.87]), and ongoing opioid use (adjusted OR = 1.82, 95% CI [1.80-1.84]). Prevalence of medication use was similar across gender, age, and racial/ethnic groups.

Conclusion: Sleep medication use is common in Veterans with chronic pain, with highest rates among patients with insomnia diagnoses. Additionally, a large number of patients without a sleep disorder diagnosis also receive medications. Findings highlight

need to connect chronic pain patients with behavioral sleep interventions. Notably, we observed a wide variety of medications without strong patterns across demographic characteristics.

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0937

DEVELOPING A PROTOCOL FOR ABBREVIATED DAYTIME SLEEP STUDIES FOR POSITIVE AIRWAY PRESSURE ACCLIMATION

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Introduction: During the COVID pandemic, there was a decrease in the number of in lab positive airway pressure titration studies as well as in person DME company guided mask fittings due to COVID related restrictions. We wanted to assess the utility of daytime abbreviated sleep studies for PAP acclimation and mask fitting on patient compliance to therapy.

Methods: We assessed patients that were seen consecutively in our sleep lab for abbreviated sleep studies for positive airway pressure acclimation and mask fittings. Compliance rates 30 days prior to encounters were compared to compliance rates over the 30 days after the PAP acclimation and mask fitting took place.

Results: We found that the majority of patients that did undergo an encounter had improvement in their compliance rates. Despite this, we recognized that there was a lack of uniformity in the patient encounter as well as documentation as there was no formal protocol in place for physicians and sleep technicians to follow during these encounters. We sought to develop a new protocol that would allow for more uniform encounters and optimized patient care as well as clear and concise documentation of the encounter.

Conclusion: It is reassuring to see that daytime abbreviated PAP acclimation and mask fitting sessions do seem to improve compliance to therapy, but we recognize that the development of a new protocol is important to determine the clinical significance of this finding. This new protocol will allow us to improve the quality of care delivered to patients during in laboratory daytime abbreviated PAP acclimation and mask fitting sessions. With a new protocol in place we can reduce variables during the encounter and it will hopefully serve as a better platform to analyze how these sessions impact overall patient compliance to PAP therapy.

Support (if any):

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0938

ENERGY DRINK CONSUMPTION AND MOTIVATION RELATED TO SLEEP AND SLEEPINESS AMONG COLLEGE STUDENTS: POSSIBLE CLINICAL IMPLICATIONS

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Introduction: We examined prevalence and motives of energy drink consumption (EDC) and the relationship between EDC and sleep in college students. A literature review revealed most common motives for EDC in the general population include promoting wakefulness, increasing energy, and enhancing alcohol's effects. Excessive daytime sleepiness has been found the day after EDC and EDC increases sleep latency (persisting up to eight hours). We pursued these questions as well as clinical implications in a college population.

Methods: Recruited from introductory psychology courses, 162 students (age: $M=22.06$ years, $SD=5.87$) met course requirements or obtained extra credit for participation. Participants completed demographic information, the Epworth Sleepiness Scale (ESS), the Pittsburgh Sleep Quality Index (PSQI), questions regarding associated features of inadequate sleep, the Sleep Hygiene Index, and questions assessing weekly quantity and motivation for energy drink consumption.

Results: 90.6% of participants consumed energy drinks (42% traditional consumer drinks such as RedBull, 77% tea/coffee, 66% soda). The most common motivations were taste (57%), completing projects (43%), staying alert (42%), preventing sleepiness (41%), and staying productive (37%). More EDC was significantly related to greater daytime dysfunction (PSQI-7) ($r(156)=.158$, $p=.024$), more maladaptive sleep hygiene ($r(158)=.206$, $p=.005$), poor sleep quality (PSQI-Global) ($r(155)=.154$, $p=.027$), shorter sleep duration ($r(155)=-.161$, $p=.022$), and associated features of poor sleep (daytime sleepiness: $r(158)=.280$, $p<.001$, worry: $r(158)=.139$, $p=.04$, and reduced attention: $r(158)=.174$, $p=.014$). Logistic regression models showed for each one additional energy drink per day, increasing odds of sleepiness ($OR=1.71$, $CI=1.21-2.40$) poor sleep quality ($OR=1.63$, $CI=1.04-2.55$), and short sleep duration ($OR=1.56$, $CI=1.14-2.13$).

Conclusion: EDC, including coffee/tea, is widespread among college students and is most frequently motivated by liking the taste and promoting productivity/alertness. The active ingredient most frequently associated with energy drinks, caffeine, is viewed as relatively innocuous. Causality is unclear, however, these data suggest frequent EDC in college students is associated with sleep problems and may oppose motivations for use (e.g., one consumes ED to combat sleepiness and/or improve efficiency and instead finds attention and sleep impaired). Education and clinical guidance could help users understand associated risks and that changes in even one drink per day could lead to clinically important improvements.

Support (if any):

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0939

OBSTETRICIAN-GYNECOLOGISTS' KNOWLEDGE AND PRACTICE PATTERNS REGARDING SLEEP DISORDERS IN PREGNANT PATIENTS

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Introduction: Prenatal sleep quality is an important factor in pregnancy and delivery outcomes and prenatal sleep disorders have been linked to a variety of negative maternal/fetal outcomes. At the same time, pregnancy itself is a risk factor for the development of several sleep disorders including insomnia, sleep apnea, and restless legs syndrome. Obstetrician-gynecologists

(ob-gyns) are well-positioned to provide access to resources or treatment for sleep disorders early in the presentation of symptoms, and thus could contribute to overall sleep health and positive birth outcomes.

Methods: A 104-question survey was developed to assess ob-gyns' knowledge and treatment patterns as they relate to screening and treating sleep disorders among pregnant patients. It was distributed to randomly selected physicians registered with the Pregnancy-Related Care Research Network (PRCRN; $N=220$).

Results: Response rate was 46%. Of those surveyed, 89.2% reported that they never screen for sleep disorders, or do so only when their patients report symptoms. When asked about various risks associated with maternal sleep disorders, providers recognized, on average, 60.9% these associations. Roughly half of providers did not recognize associations between maternal sleep disorders and gestational diabetes (49%), maternal mortality (54.9%), premature delivery (51%), or low infant birth weight (50%). Only 18.6% recognized the association between sleep disorders and cesarean delivery. While 99.0% of respondents endorsed that sleep quality is important to wellness, and 90.2% reported that it is an important issue for their patients, only 14.7% and 11.8% reported confidence in their own ability to diagnose and treat sleep disorders, respectively.

Conclusion: There are significant opportunities for educating ob-gyns about sleep disorders and their impact on perinatal outcomes. Additional resources aimed at increasing screening of pregnant patients during perinatal visits could increase early interventions and improve maternal/fetal outcomes.

Support (if any):

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0940

REDUCTIONS IN USE OF SLEEP AIDS FOLLOWING AN APP-BASED SLEEP COACHING PLATFORM

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Introduction: Use of sleep supplements and other sleep aids is increasing. Yet, many of these are not supported strategies for ameliorating sleep problems. Providing educational and behavioral strategies may reduce reliance on these substances.

Methods: Data were obtained from $N=93$ individuals who participated in the 12-week Sleep Reset program. The Sleep Reset program (Simple Habit, Inc.) includes ongoing text-based communication with coaches trained to support sleep behavior change, and a mobile app that includes a sleep diary, educational modules, mindfulness exercises, and progress tracking. Potential users are screened prior to entry and if they demonstrate a contraindicated medical or psychiatric problem, they were not admitted to the coaching program. If they demonstrate a likely sleep disorder (including insomnia disorder) they are referred for additional support. The coaching communications included information about basic sleep and circadian principles (e.g., sleep hygiene, behavioral scheduling, light exposure, relaxation) and techniques based on CBTi (e.g., stimulus control). Participants were asked if they used any "sleep aids" (which could include medications or melatonin/supplements) daily while in the program. Type of substance was not assessed. Data were binned by week, dichotomized as yes/no regarding any use in that week.

Results: Of the N=93 participants, N=46 (49%) indicated that they used “sleep aids” at least once in the first week. Among Sleep Reset participants who reported using sleep aids at least once in their first week in the program, use was reduced to N=13 (28.9%) by week 12. This difference was statistically significant ($t(44)=10.4$, $p<0.0005$). Reductions from week 1 were already seen in week 2 (57.8%; $t(44)=5.7$, $p<0.0005$). Another reduction was seen between weeks 3 and 4 (51.1% to 37.8%, $t(44)=1.8$, $p=0.042$), and a trend was seen between weeks 9 and 10 (35.6% to 26.7%, $t(44)=1.7$, $p=0.052$).

Conclusion: In an app-led sleep coaching program, those who used sleep aids in week 1 reduced use by 71.1% by the end of the 12-week period, with the largest reductions in the first week. Future controlled studies are needed to validate whether a sleep coaching program can reduce use of sleep aid such as supplements that may not be helpful.

Support (if any):

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0941

SLEEP APNEA TESTING IN HOSPITALIZED PATIENTS: ARE PATIENTS FOLLOWING UP?

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Introduction: Obstructive sleep apnea (OSA) can often be recognized in an inpatient setting where patients are continuously monitored. Although an unattended portable sleep study can successfully diagnose OSA in many inpatients, allowing for earlier intervention, a loss to follow up can compromise effective treatment. This study aims to determine the rate of hospital follow-up in patients who are diagnosed with OSA on a portable inpatient sleep study.

Methods: We included adult inpatients who underwent portable sleep studies from 2013 to 2022. This is a retrospective study design. Individual charts were reviewed to determine demographics including age, gender, and race. Co-morbidities and length of stay were recorded. Sleep study data analyzed included total recording time, total estimated sleep time, overall apnea-hypopnea index (AHI) and nadir oxygen saturation. Primary outcome was percentage of patients with AHI 5/h with scheduled follow up visit. Secondary outcome was percentage of patients with AHI 5/h completed outpatient follow-up visit.

Results: 104 patients were included for analysis. Majority were middle aged (55.2 SD15.9 years-old), black ($n=71$, 68.2%) and male gender ($n=64$, 62%). A minority identified as Hispanic ($n=7$, 6.7%). The total number of sleep studies with AHI 5/h was 95 (91.3%) and the mean AHI was in the severe range (42.8 SD31.4/h) with significant associated oxygen desaturations (mean nadir oxygen saturation 77.1 SD10.6%). Primary outcome: the number of patients with a positive sleep study for OSA (AHI 5/h) who had scheduled for follow-up at discharge was 57 (60%). Secondary outcome: 54.4% of patients with positive sleep study and scheduled follow-up completed the outpatient visit.

Conclusion: The percentage of patients lost to follow-up is high despite diagnosing OSA successfully with an inpatient portable sleep study. Close to half of the patients had no scheduled follow-up, and the “no show” rate remained high (close to 50%) in those who had a sleep medicine appointment. Future studies should explore effective interventions to improve the follow-up rate and overall adherence to treatment.

Support (if any):

Abstract citation ID: zsad077.0942

0942

SLEEP DURATION BENEFITS FOR SPANISH-SPEAKING HISPANIC/LATINE RESPONDENTS OF THE 2020 BRFSS

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Introduction: Habitual sleep duration is associated with many aspects of health. Previous studies show that some groups of Hispanic/Latine Americans are somewhat protected from sleep disparities seen in other groups, but also that this may depend on acculturation. This study expanded this finding to nationally-representative data and explored some potential pathways that may link acculturation and sleep in Hispanics/Latinos.

Methods: Data from the 2020 Behavioral Risk Factor Surveillance System (BRFSS) were used ($N=309,548$ provided complete data). Habitual sleep duration was self-reported in hours and converted to minutes for analysis. Race/ethnicity was self-reported as Non-Hispanic White, Black/African American, Hispanic/Latine, Asian/Pacific-Islander, American Indian/Alaskan Native, and Multiracial/Other. The Hispanic/Latine group was further divided into those who chose to complete the survey in English versus Spanish. Covariates included age, sex, education level, household income, employment status, overall health, and mental health. Linear regression examined sleep duration (minutes) as the outcome, with race/ethnicity as the predictor. Race/ethnicity-by-covariate interactions were explored.

Results: Compared to non-Hispanic Whites, Blacks/African Americans reported 7.4 minutes less sleep ($p<0.0005$), English-speaking Hispanics/Latine reported 4 fewer minutes ($p=0.038$), Spanish-speaking Hispanic/Latine reported 16.9 more minutes ($p<0.0005$), Asians/Pacific Islanders reported 4.7 fewer minutes ($p=0.042$), no difference was seen for American Indians/Alaskan Natives, and Multiracial/Others reported 9.5 fewer minutes ($p<0.0005$). Significant interactions were seen for age, education, income, employment, health, and mental health (all $p<0.05$). Sleep duration benefits of speaking Spanish were evident especially in younger groups (under age 50, peaking age 30), those with more education, those with higher income, those in better health, those with fewer mental health problems, and those who were employed or were students.

Conclusion: Spanish-speaking Hispanics/Latine Americans were the only race/ethnicity group to report more sleep than non-Hispanic White adults and showed markedly different relationships versus when including English-speaking Hispanic/Latine adults. This advantage was differentially experienced, though, and depended on age, socioeconomic, and health status. Also, the BRFSS did not ask about primary household language nor English fluency. Future research is needed to explicitly explore acculturation-related explanations and develop linguistically- and culturally-targeted interventions for sleep health, especially for addressing apparent generational and socioeconomic differences.

Support (if any):

Abstract citation ID: zsad077.0943

0943**SLEEP MEDICINE TWEET-BY-TWEET, AN ELECTRONIC PLATFORM FOR COLLABORATIVE MEDICAL EDUCATION**Ran Liu¹, Robert Thomas², Eric Heckman², Michael Mak³¹ Markham Stouffville Hospital, ² Beth Israel Deaconess Medical Center, ³ University of Toronto

Introduction: Twitter is a novel and accessible platform for the dissemination of medical education, and it is used by many medical practitioners (1). Many physicians have used Twitter as a means of meeting continuing medical education needs. This can manifest as Twitter-based Journal Clubs, curated conference data and webinars (2).

Methods: I have created a Sleep Medicine Medical Education Twitter account @SleepyNeuroDoc to share complex cases in all areas of sleep medicine, including sleep-disordered breathing, movement disorders in sleep, circadian rhythm disorders and nocturnal epilepsy. I share notable images of polysomnogram outputs, home sleep apnea tests, compliance data, neuro-imaging, electroencephalogram, cardiopulmonary coupling and more. This digital education platform allows rapid circulation of unique cases and promotes in-depth scholarly discussion, with no geographical limit. Polls are conducted for complex topics to facilitate knowledge exchange and consumer engagement. This educational twitter is followed by the entire spectrum of professions within the sleep medicine care team, including physicians, allied health, and researchers. To date, there are 40 cases posted.

Results: We conducted online questionnaires with consumers of this Twitter account, and the results so far indicate greater practitioner comfort with management of various sleep medicine conditions. Some consumers report having changed their approach to practice.

Conclusion: Our work suggests that this unique use of a social medical platform is beneficial for continuing medical education and knowledge exchange in the field of Sleep Medicine. References: 1. Chretien KC, Azar J, Kind T. Physicians on Twitter. JAMA. 2011;305(6):566-568. 2. Thamman R, Gulati M, Narang A, et al. Twitter-based learning for continuing medical education? Eur Heart J. 2020;41(46):4376-4379.

Support (if any):

Abstract citation ID: zsad077.0944

0944**TELEMEDICINE (TM) TO PROVIDE OUTPATIENT CARE FOR SLEEP DISORDERS IN COMPLEX NEUROLOGICAL PATIENTS IN AN ACADEMIC MEDICAL CENTER**Sudha Tallavajhula¹¹ University of Texas Health Sciences Center

Introduction: Since the widespread adoption of telemedicine (TM) as a reimbursable option for the delivery of healthcare, (particularly clinic visits), the field of sleep medicine has been a beneficiary. In complex neurological patients, it was hypothesized that physical and cognitive constraints would limit the use of TM. This analysis was undertaken to evaluate patient care strategies in an academic neurology department based in a large metropolitan city

Methods: 2964 adult patients who opted for neurology clinic visits via video TM in the last 6 months were included from electronic

medical record review at the University of Texas Health Sciences Center in Houston. Of these, 557 were seen in sleep medicine specialty. A successful visit was defined as a simultaneous connection of at least 2 parties for a minimum duration of time defined by institutional guidelines. Patients were analyzed in age subgroups (< 30, 31-50, 51-70 and >70 years of age) as well as race (Asian, Black, Hispanic, White and Others). Neurological diagnoses in these patients included stroke, epilepsy, movement disorders, cognitive disorders, neuromuscular conditions and less commonly multiple sclerosis

Results: Sleep medicine providers comprise of 2/53 (3.7%) of the department's clinical providers, but accounted for 18.7% of TM visits. 97% (182/186) of new patients and 95% (354/371) of established patients had successful TM visits. Among general neurology patients, these numbers were 89% and 88% respectively. There was a statistically significant difference between successful visits in the sleep medicine and overall neurology patient groups (p value 0.0003 for new, 0.0001 for established patients). Among sleep medicine patients, percentage failures were 2.9, 3.3, 4.1 and 3.9 among the respective age groups. Percentage failures across the respective racial groups were 0, 6.1, 4.8, 4.2 and 1.9. Reasons cited for unsuccessful visits included camera, microphone and general hardware failures. Surprisingly network failure was not reported

Conclusion: The success of telemedicine clinic visits for the management of sleep disorders is not impacted by physical and cognitive impairment in patients with complex neurological conditions. Further analysis to include success of sleep diagnostics and treatment of sleep disorders (start-to-finish pathway), via telemedicine in this complex population is underway

Support (if any): None

Abstract citation ID: zsad077.0945

0945**A ROBUST HYBRID ALGORITHM FOR AUTOMATIC RESPIRATORY EVENTS SCORING IN ADULTS**Myeong Seok Kim¹, Tae Kyoung Ha², Ho Dong Lee², Young Jun Lee²¹ Honeynaps co. ltd, ² HONEYNAPS Co. Ltd.

Introduction: Even though Polysomnography has many advantages, manual scoring is a labor intensive and time consuming. Therefore, automatic scoring system using a deep learning algorithm has been developed and commercialized for clinical sites. However, it is challenging to explain the results of respiratory events and to measure a precise event's duration. To overcome these challenges, a new hybrid algorithm was proposed to explain why this event was categorized and provided the accurate duration of respiratory events.

Methods: In order to classify respiratory events - OSA, MSA, CSA, O-hypopnea, and C-hypopnea, the proposed algorithm consists of two algorithms – deep learning and post processing algorithms. Deep learning algorithm was used to detect candidates of respiratory events and post processing algorithm was used to determine the final classification and to measure duration of events. Deep learning model consisted of five layers: a perceptron layer, three consecutive layers of long short-term memory (LSTM) cells, and two more perceptron layers. A total of 1,000 case PSG data were enrolled to develop this algorithm. To classify respiratory events from the results provided by the deep learning algorithm, auto-correlation, peak detection, de-noise filtering and transition detection were used to obtain respiratory rate and measure signal amplitude. Using these algorithm's results, amplitude and time of baseline breathing and respiratory events were calculated and classified based on the AASM's guidelines.

Results: To evaluate the performance of proposed algorithm, 30 PSG data were selected and compared with the results of deep learning algorithm. The test dataset consisted of thirty subjects with 15 OSA, 5 PLMS, 2 insomnia and 8 healthy. The kappa value of deep learning algorithms showed 0.77 (0.759, 0.78) and that of proposed algorithm was 0.838 (0.832, 0.843). They showed better agreement by 0.068 than that of deep learning algorithm. In addition, the proposed algorithm provided the classification results such as OSA, MSA, CSA, O-hypopnea and C-hypopnea and explanations of the reason of event detection.

Conclusion: The proposed algorithm showed better agreement and versatile classified results. This algorithm will be adopted for new automatic sleep scoring solution and this solution will be very helpful to use in real clinical sites.

Support (if any):

Abstract citation ID: zsad077.0946

0946**CIRCUL: VALIDATION OF A SMART RING FORM OXIMETER IN INDIVIDUALS WITH DARK SKIN PIGMENT**Miguel Meira e Cruz¹, Enguo Chen², Young Zhou³, Dengui Shu⁴, Congcong Zhou⁵, Meir Kryger⁶¹ Cardiovascular Center, University of Lisbon, School of Medicine,² Zhejiang University, School of Medicine, ³ Zhejiang University, School of Medicine, ⁴ Zhejiang University, ⁵ ⁴. Zhejiang University, Biomedical Sensors National Special Laboratory of Biomedical Engineering& Instrument Science, ⁶ Yale University, School of Medicine

Introduction: The potential impact of skin pigmentation on the accuracy of oximetric assessment has long been known to be a clinically relevant matter. During the COVID pandemic it became apparent that oximeters may underestimate oxyhemoglobin saturation in darkly pigmented individuals. Validation data for SaO₂ is not generally available for the many consumer wearable oximeter devices. Circul® (Bodimetrics Corp, Los Angeles, CA), a wearable oximeter with a form factor of a ring, measures several variables for cardiorespiratory assessment (SpO₂, movement, heart rate). We aimed to evaluate the accuracy this device in the measurement of SaO₂ compared to a simultaneous values obtained by measurement of SaO₂ by arterial blood gases.

Methods: 24 subjects (8 Black, 16 Non-Black) participated in the validation of the Circul device. In an operating suite they had catheters inserted into their radial arteries. They were administered nitrogen rich air which made them hypoxic in steps to an SaO₂ of 70%. Arterial blood was sampled at various levels of hypoxia and simultaneous readings were obtained from the Circul device. We compared SaO₂ obtained by Circul vs measurement of ABGs by a medical grade blood gas analyzer.

Results: There was excellent correlation between SaO₂ measured by the ring oximeter and ABGs in both Black ($y = 1.0174x - 1.573$; $R^2 = 0.9414$) and Non-Black ($y = 1.0209x - 2.5607$; $R^2 = 0.9207$) subjects. No significant differences were found in comparing the intercept and slopes of the regressions. At ABG of 70% and 100% the SaO₂ measured by the ring was calculated to be 69.6% and 100.2% for the Black subjects and 68.9% and 99.5% for the non-Black subjects.

Conclusion: Results from this study confirmed that Circul oximetry accuracy seems to be independent of the skin tone.

Support (if any): 0947

Withdrawn

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0948**END-TO-END UTILITY OF THE CARDIOPULMONARY COUPLING SLEEP SPECTROGRAM IN SLEEP MEDICINE**Cameron Barber¹, sahil chopra², Rena Holzer¹, Kimberly Campbell¹, Eric Heckman¹, Anjali Ahn¹, Robert Thomas¹¹ Beth Israel Deaconess Medical Center, ² Empower Sleep

Introduction: Technology has improved the diagnosis and therapeutic tracking of sleep disorders, but remains fragmented. For example, the laboratory polysomnogram and home sleep apnea test is disconnected from the data available from therapy devices.

Remote patient monitoring has focused more on apnea metrics rather than sleep quality. There is some value to a device or system which can be used for diagnosis, risk stratification, and tracking of clinical outcomes across different sleep disorders.

Methods: A method which offers the potential of end-to-end utility in sleep medicine is the cardiopulmonary coupling (CPC) spectrogram. Originally an ECG-base device, the current form is that of a Ring oximeter (finger) with an integrated activity monitor. The oximeter data is processed via Bluetooth in a smartphone, and then transferred to a Cloud-based analysis (www.sleepimage.com). The CPC analysis integrates heart rate variability and ECG or photoplethysmography-derived respiration. Outputs include a Sleep Quality Index and percentage of stable sleep (high frequency coupling which covaries with delta power on the electroencephalogram and is associated with blood pressure dipping), unstable sleep (low frequency coupling), an apnea-hypopnea index, oxygen desaturation index, heart rate profile across the night (dipping or non-dipping heart rate), total sleep time and sleep efficiency. Data from two clinical systems were used: Empower Sleep (an Internet-based “digital sleep clinic”) and Sleep Continuum (a sleep tracking service offered by Neurocare, Inc, in the Boston area).

Results: Data from over 500 patients across a range of sleep disorders show end-to-end utility of the SleepImage system. These include diagnosis of sleep apnea including multi-night recording, sleep apnea phenotyping (high loop gain and sleep fragmentation), remote patient monitoring during CPAP or oral appliance use, supportive information for diagnosis of hypersomnia, tracking medication effects (sodium oxybate, sedative-hypnotics, acetazolamide), sleep-wake instability in mood disorders and Long-Covid, impaired sleep quality in chronic fatigue syndrome and restless legs syndrome, off-label therapies for central sleep apnea (oxygen, acetazolamide, buspirone), and sleep fragmentation in Long-Covid and parasomnia. Examples from each of these clinical use cases will be shown.

Conclusion: The CPC-based SleepImage Ring system can provide complete diagnostic, phenotyping, and tracking functions.

Support (if any): The Institute for Personalized Sleep Health, BIDMC, Empower Sleep

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0949

REAL-TIME ACOUSTIC APNEA EVENT DETECTOR BY TRAINING A DEEP LEARNING MODEL WITH HOME NOISE ADDED DATA

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Introduction: For diagnosis and management of Obstructive Sleep Apnea (OSA), long-term multi-night monitoring is crucial. Convenient detection of OSA at home is required for this purpose. Using sound recorded by smartphone can provide a convenient way to detect OSA. In this study, we present a sound-based OSA detection deep learning model that can detect OSA in real-time even in a home environment where various noises exist. The model is trained with home noise simulated sound to be robust for detecting home noises.

Methods: Two types of data were used for training and testing. The first type was sleep breathing sound data collected at the hospital while patients underwent a PSG. It included 1,154 and 297 nights recorded by a PSG microphone and a smartphone, respectively. We split them into 150 nights of smartphone data for testing and the rest for training. The second type was home noise data, which included 22,500 noises that might occur in a residential environment. The proposed acoustic apnea event detector inputs Mel spectrograms of sleep breathing sounds and outputs OSA event classes for each epoch (APNEA, HYPOPNEA, or NO-EVENT). The home noises were used to make the model robust to a noisy home environment. The performance of the prediction model was assessed by epoch-by-epoch prediction accuracy and OSA severity classification based on the apnea-hypopnea index (AHI).

Results: Our model achieved 86 % epoch-by-epoch agreement (0.75 in macro F1) for 3-class event detection task. The model had an accuracy of 92% for NO-EVENT, 84% for APNEA, and 51% for HYPOPNEA. Most misclassifications were made for HYPOPNEA, with 15% and 34% of HYPOPNEA being wrongly predicted as APNEA and NO-EVENT, respectively. The sensitivity and specificity of OSA severity classification (AHI ≥ 15) were 0.85 and 0.84, respectively.

Conclusion: Our study presents a real-time epoch-by-epoch OSA detector that works in a variety of noisy home environments. Based on this, additional research is needed to verify the usefulness of various multi-night monitoring and real-time diagnostic technologies in the home environment.

Support (if any):

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0950

SOUND-BASED SLEEP STAGING AT HOME USING SMARTPHONE VIA DEEP LEARNING

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Introduction: Daily sleep tracking at home is growing in demand as more and more people are aware of the significance of sleep. The objective of this study is to propose a sound-based sleep staging model based on deep learning that works well in home environments with recorded audio data from general smartphones.

Methods: Three different audio datasets were used. A labeled hospital dataset (PSG and audio, N=812) and an unlabeled home dataset (audio only, N=829) were used for training. A limited number of labeled sound data from home (PSG and audio, N=45) were used for testing. Our proposed HomeSleepNet has three components: (1) supervised learning using the labeled hospital data that trains the model to make correct predictions in hospital environments; (2) unsupervised domain adaptation (UDA), which used both the labeled hospital data and unlabeled home data, and transferred the sleep staging power from hospital domain to home domain by adversarial training; (3) unsupervised data augmentation for consistency training (UDC), which augmented hospital data by adding home noise

and trained the model to make consistent predictions on original and augmented data. After all training, HomeSleepNet is expected to make robust sleep staging despite the home noise presence.

Results: HomeSleepNet achieved 76.2% accuracy on the sleep staging task in home environments for the 3-stage classification case (Wake, NREM, REM). Specifically, it correctly predicted 63.4% of wake, 83.6% of NREM sleep, and 64.9% of REM sleep. The contributions of UDA and UDC were demonstrated by the following results. The accuracy of the model trained without both was 69.2%. Either addition of UDA or UDC training to the model improved the performance, with increased accuracy of 69.3% for UDA and 73.5% for UDC. As expected, using both UDA and UDC (i.e., HomeSleepNet) achieved the best performance, with a 7% increase in accuracy compared to the model trained without both components.

Conclusion: To the best of our knowledge, this is the first sound-based sleep staging study conducted in home environments. Moreover, the sounds were recorded by commercial smartphones and not through professional devices. Our proposed model introduced a reliable and convenient method for daily sleep tracking at home.

Support (if any):

Abstract citation ID: zsad077.0950

0951

INTER-SCORER RELIABILITY BETWEEN SOMNO-ART SOFTWARE AND 5 SLEEP CENTERS

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¹ PPRS-Research, ² Henry Ford Hospital, ³ Minerva Neurosciences

Introduction: A number of studies have evaluated epoch-by-epoch agreement between 2 technologists in scoring individual sleep stage. Scoring for the specific sleep stages average agreement ranged from 20% to 90% in different studies. The goal of this study is to evaluate the validity of the Somno-Art analyses against a pool of scorers including validated automated system for scoring polysomnograms.

Methods: Sixty polysomnography recording nights, representative of clinical practice (participants who are healthy or suffering from obstructive sleep apnea [OSA], or insomnia or major depressive disorder [MDD]), were scored by 5 different sleep scoring centers and by the Somno-Art Software (total of 6 scorers). Intra-class correlation coefficient (ICC) and Wilcoxon Signed-Rank Test were calculated between each scorer and the average value of the 6 scorers. In addition, epoch-by-epoch agreements between scorers were analyzed.

Results: Somno-Art Software estimation of sleep efficiency, wake, N1+N2, N3 and REM sleep belonged to the interscorer range for the full dataset and the participant groups, except N3 sleep in OSA patients. Somno-Art Software tended to overestimate sleep latency with a significant difference to the average scoring for insomniacs (4.7 ± 1.6 min). On the full dataset, Somno-Art Software had good or excellent ICC scores for all sleep parameters except N3 sleep (moderate score). 4-stages epoch-by-epoch agreement ranged between 78.5-88.7% for the visual scorers and 69.9-71.2% for Somno-Art Software. For the healthy participants, visual scorers agreed between 68.9 and 86.9%, while Somno-Art Software overlapped this range with an interscorer agreement between 62.0 and 71.4%.

Conclusion: Somno-Art solution provides results that are comparable to manual and automatic scoring for commonly used metrics in sleep medicine. It shows a robust interscorer reliability in the range of the 5 polysomnography scorers

Support (if any):

Abstract citation ID: zsad077.0951

0952

A LONG WINTER'S SLEEP: WHAT DOES BIG DATA FROM CONSUMER SLEEP TECHNOLOGY TELL US?

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Introduction: Light is the most powerful zeitgeber influencing sleep-wake patterns, and winter's shorter days have profound effects on mood, energy, and metabolic function. Here, we leverage big data from consumer sleep technology to examine the relationship between objectively measured sleep in winter versus summer months in the United States.

Methods: The dataset included 21,101 users residing in the US across 1,255,518 nights (age range: 17-90, mean age: 46.6 ± 16.7 years, 59% female). Data were extracted from 01 January 2019 until 31 August 2022. Seasons were defined according to the Northern Hemisphere's meteorological calendar and included winter (December - February) and summer (June - August). USA public holidays were mapped and removed from the data. The relationships between objectively measured sleep and winter versus summer were examined using linear regression models, controlling for age and gender.

Results: A shift to later average monthly wake times were observed in both summer and winter, peaking in summer. Similarly, bedtimes shift later in summer and winter, yet the shift in summer was greater than winter (winter vs summer: waketime: 07:06 vs 07:07, $\beta = -0.46$, $SE = 0.023$, $p < 0.001$, bedtime: 23:17 vs 23:23, $\beta = 0.12$, $SE = 0.006$, $p < 0.001$). Although bedtime and wake times delay during the winter and summer seasons, measures of sleep health including sleep duration, sleep efficiency, and SleepScore peak in winter and slowly decline to their lowest point during the summer months (winter vs. summer: SleepScore 78.4 vs 77.6, $\beta = -0.89$, $SE = 0.17$, $p < 0.001$; sleep duration 359.6 min vs 352.8 min, $\beta = -4.8$, $SE = 1.02$, $p < 0.001$; sleep efficiency 77.5 vs 76.6, $\beta = 0.86$, $SE = 0.038$, $p < 0.001$).

Conclusion: Bedtime and wake time delays were greater in summer than winter, likely contributing to small improvements to sleep quality, duration, and efficiency in winter compared to summer. These findings are generally supported by previous research examining sleep-wake patterns in locations with extreme seasonal differences, such as Northern Norway, where, despite midnight sun and polar nights, researchers have found little variation in sleep-wake timing.

Support (if any): SleepScore Labs

Abstract citation ID: zsad077.0952

0953

A NOVEL ACTIVE HUMIDIFIER FOR NON-INVASIVE VENTILATED PATIENTS

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Introduction: The RespirAq® humidifier is a novel, active heated humidifier that humidifies without the need for additional water. Within milliseconds, the humidifier switches between a super-hydrophilic state to capture moisture during expiration, and a super-hydrophobic state, returning moisture during inspiration. The device delivers gases at 37°C/100% relative humidity to individuals requiring humidification, including those with tracheostomies. We demonstrated the device meets EN ISO 80601 2 74:2020 during bench testing. This study aimed to compare the performance of the novel humidifier with a heated humidifier - HH (MR850™ Fisher & Paykel Healthcare) and a heat and moisture exchanger - HME (DAR™ Covidien) in healthy volunteers during non-invasive ventilation (NIV) using a non-vented full face mask.

Methods: Ten healthy volunteers were recruited. NIV was performed at different settings (inspiratory positive airway pressure (IPAP) range 5-20cmH₂O, expiratory positive airway pressure (EPAP) = 5cmH₂O) over a one-hour period. Humidity and temperature were collected continuously during the study.

Results: Sixty per cent of participants were female. Mean age of 35.6 ± 5.89 years (M±SD, n=10). Absolute humidity inside the face mask increased from 22.55 ± 2.41 mg/L without humidification to 30.18 ± 2.07 mg/L with an HME, and 39.09 ± 1.05 mg/L and 38.23 ± 1.78 mg/L when using a water-based heated humidifier and the novel humidifier, respectively. When comparing the performance of the humidification devices head-to-head, the two heated humidifiers significantly outperformed the HME (HME vs Novel = P < 0.0001, HME vs HH = p < 0.0001) and there was no significant difference seen between the two active humidifiers (p = 0.2047).

Conclusion: Results show that the device meets the 12 mg/L absolute humidity established by the EN ISO 80601-2-74:2020 standards and that there is no significant difference in performance compared to traditional heated humidification. This suggests that the novel device can deliver the performance of a heater humidifier at the size, reliability and ease of use of a heat and moisture exchanger. Due to the mechanism of action, droplet/aerosol transmission of COVID-19 may also be mitigated. Further studies are warranted to confirm these findings.

Support (if any): This research was supported by Tier 2 KiwiNet funding.

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0954

CORRELATION OF PULSE RATE VARIABILITY (PRV) AND HEART RATE VARIABILITY (HRV) METRICS DURING SLEEP IN SUBJECTS SUSPECTED OF OSA

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Introduction: Whether photoplethysmography (PPG)-derived pulse rate variability (PRV) metrics can be surrogates for ECG-derived heart rate variability (HRV) is a decade-long debate. Very few studies have assessed the performance of PRV metrics in wearables. We aimed to evaluate the performance of time- and frequency-domain PRV metrics derived from the Belun Ring (BR) in subjects suspected of sleep apnea.

Methods: Using Pearson's correlation coefficient (PCC), we retrospectively analyzed the relationship between concurrent BR-PRV and PSG ECG-HRV metrics (standard deviation of NN intervals [SDNN], root mean square of successive RR interval differences [RMSSD], percentage of successive RR intervals that differ by more than 50 ms [PNN50], HF [high frequency] power, LF [low frequency] power, VLF [very low frequency] power, and LF/HF ratio) in 73 subjects suspected of OSA. Subgroup analyses were performed based on demographic information, OSA, co-morbidities, and HR-affecting medication status.

Results: Age (SD) 50.1 (13.4); female 68%; black 52%; BMI (SD) 36.1 (9.7); 56% OSA; mean AHI (SD) 14.7 (17.3). Nine (12%) subjects had significant arrhythmias (defined as having any arrhythmias in ≥25% of all 12-second segments.) Key findings: There was a unitary linear relationship between BR PPG-pulse rate and ECG-heart rate in the overall group. In those without significant arrhythmias (N=64), PRV-SDNN, PNN50, HF, LF, and VLF had excellent correlations (PCC ≥0.90) with corresponding HRV metrics in all subgroups. PRV-RMSSD and PRV-LF/HF also had a strong correlation (PCC ≥0.80) with ECG HRV-RMSSD and HRV-LF/HF in all subgroups except for LF/HF in the diabetes group. In those with significant arrhythmias (N=9), PRV performed less well, with most metrics having PCC < 0.90 or wide CI, except for PNN50. All PRV metrics had PCCs ≥0.90 in subjects on HR-affecting medications except for LF/HF.

Conclusion: BR-PRV metrics can serve as surrogates for ECG-HRV in patients suspected of OSA who do not have significant arrhythmias. PRV-RMSSD and LF/HF may be less robust than the rest of the PRV metrics but still showed strong correlations in most subgroups. BR-PRV can be a useful clinical and research tool in assessing autonomic nervous system function.

Support (if any): This study is supported by a Grant from Belun Technology Company.

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0955

EVALUATING STATE-OF-THE-ART ALGORITHMS FOR SLEEP-WAKE CLASSIFICATION USING WRIST-WORN WEARABLE DEVICES

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Introduction: Over the last 40 years, a variety of algorithms have been proposed to classify sleep-wake from wrist acceleration data. Input features into these algorithms have been activity counts or raw acceleration. The algorithms proposed range from a single heuristic rule to logistic regression to machine learning and deep learning. The purpose of this work is to evaluate and compare the accuracy of these algorithms against polysomnography (PSG) annotations on a common dataset from a sleep laboratory.

Methods: The Newcastle PSG dataset was used to compare the various sleep-wake prediction algorithms to concurrent PSG annotations in thirty second epochs. This dataset contains 28 patients, 27 of which had wrist acceleration data for both the right and left wrist and one which had data for the left wrist only. Twenty of the participants had at least one sleep disorder. Sleep disorders included idiopathic hypersomnia, restless leg syndrome, sleep apnea, narcolepsy, sleep paralysis, nocturia, obstructive sleep apnea, RBD, parasomnia and insomnia.

Results: The domain adversarial convolutional neural network (DACNN) model showed the best overall results (sens=83.9, spec=57.6, f1=81.7, WASO-RMSE=80.9). The next best performing model according to WASO-RMSE was Cole-Kripke (sens=81.4, spec=50.3, f1=78.0, WASO-RMSE=90.4). This was followed by the van Hees heuristic model (sens=83.6, spec=47.5, f1=79.1, WASO-RMSE=91.1). The fourth best performing model was the Random Forest model (spec=77.5, sens=55.5, f1=76.4, WASO-RMSE=93.0). The fifth best performing model was Sadeh (sens=82.6, spec=49.7, f1=78.5, WASO-RMSE=93.6). The sixth best performing model was the LSTM model (sens=78.6, spec=58.9, f1=77.8, WASO-RMSE=93.9). The worst performing model was the CNN model (sens=79.8, spec=54.2, f1=77.8, WASO-RMSE=99.8). * sens=sensitivity, spec=specificity, WASO=wake after sleep onset, RMSE=root mean squared error

Conclusion: The DACNN algorithm outperformed all other algorithms on sleep-wake classification from wrist acceleration data. Despite being vastly different in input features' types and

algorithm complexity, all other algorithms performed similarly on the dataset, with f1 scores ranging from 76.4 to 79.1 and WASO-RMSE ranging from 90.4 to 99.8.

Support (if any):

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0956

EVALUATION OF A NOVEL AUTOMATED OXYGEN DESATURATION ANALYSIS

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Introduction: The oxygen desaturation index (ODI) quantifies the number of desaturations per hour of sleep and is a valuable parameter in diagnosing sleep-related breathing disorders. While oximetry alone is insufficient for an accurate diagnosis, it provides meaningful insights for Obstructive Sleep Apnea (OSA) and the ODI has been shown to correlate with the Apnea-Hypopnea Index (AHI). The close relationship between the ODI and other parameters is especially interesting for home-based sleep studies and/or screening, which typically use a limited set of sensors (but almost always include oximetry) and are becoming increasingly more prevalent. An accurate and automated tool for oximetry analysis will thus be paramount for the sleep clinician.

Methods: The current study aims to evaluate a novel automated solution for oxygen desaturation scoring, provided by Somnilog. We selected 20 overnight recordings, a mix of hospital- and home-based recordings from a dataset from the Antwerp University hospital and an internal database collected from several French sleep centers. The analyzed population (10 females, age 53.0±16.7 years old, BMI of 28.8±4.8 kg/m²) had a variety of diagnoses, including non-apneic snoring and central and obstructive sleep apnea. Each recording was also scored for oxygen desaturations by a sleep expert, using the AASM guidelines and a 3% drop criterion.

Results: The automated solution accurately detected desaturation events with a precision and recall of 0.97 and 0.96, respectively. The reported ODI had an intraclass correlation (ICC) of 0.99 with the index found by the expert. The difference in the number of events reported by the automated solution and the expert was not significant between the lab- and home-recorded patients (p=0.23). We furthermore validated the novel solution with another well-used commercial package and obtained similar performance metrics: precision and recall of 0.96 and ICC of 0.99.

Conclusion: The current study demonstrates the validity of the novel commercial package for oxygen desaturation scoring. The automated tool achieved near-perfect agreement with the sleep experts, and a similar performance to another existing solution in the market. The tool is robust for home-based recordings which are typically more artifact-prone, thereby supporting the increasing demand for out-of-centre overnight studies.

Support (if any): n/a

Abstract citation ID: zsad077.0956

0957**SLEEPING FOR ONE WEEK ON A TEMPERATURE-CONTROLLED MATTRESS COVER IMPROVES SLOW WAVE SLEEP, HEART RATE, AND HEART RATE VARIABILITY**Nicole Moyer¹, Tatiana Ediger¹, Erin Hancock¹, Lucas Holden¹, Kevin Kotzen¹, Charles Irick¹, David He¹¹ Eight Sleep

Introduction: Body temperature should be tightly regulated for optimal sleep. A decline in core temperature during sleep onset can increase slow wave sleep (SWS) and decrease heart rate (HR). Passive solutions such as high-heat capacity mattresses are difficult to maintain temperature control during sleep. Thus, we examined how sleeping on an active temperature-controlled mattress cover (TCMC; i.e., the Eight Sleep Pod) for one week affected sleep and cardiovascular health.

Methods: 49 participants [24 men, 25 women; mean±SD (range): age = 34.4±11.5 (21.8-64.6) years] slept for 16 nights each (784 total nights) with TCMC temperature-control off (OFF) for the first week as baseline, TCMC temperatures on (ON) at their desired temperatures for the second week, and TCMC OFF for two nights. Participants wore a home sleep test device (HST) for eight nights total: four nights during each OFF and ON for ground truth sleep-staging. Participants wore a Fitbit device throughout the study to collect nightly HR and heart rate variability (HRV). Paired t-tests compared each participant's sleep and HR/HRV for TCMC ON vs. OFF, separating for biological sex and TCMC temperature. A multiple linear regression was used to evaluate the percent change in SWS from OFF to ON.

Results: Four factors explained 64% of the variance in the percent change in SWS from OFF to ON ($r^2=0.64$; $P<0.001$): participants' baseline SWS during OFF, age, average mattress-cover temperature, and sex. Men sleeping at cooler temperatures ($<26^\circ\text{C}$) increased SWS by 17 min ($P=0.0001$; $\text{cohen's-}d=0.65$), decreased HR by 1.5 beats/minute ($P=0.007$, $\text{cohen's-}d=0.20$), and increased HRV by 13% ($P=0.045$; $\text{cohen's-}d=0.23$). Women's sleep was unaffected by TCMC ON (all $P>0.05$); however, sleeping at warmer mattress-cover temperatures ($>27^\circ\text{C}$) decreased HR by 1.5 beats/minute ($P=0.021$; $\text{cohen's-}d=0.18$).

Conclusion: Sleeping on an active temperature-controlled mattress cover at cooler temperatures significantly improved SWS in males, especially those with below-average SWS at baseline and increasing age. One week of sleeping on the TCMC improved HR in both sexes similar to exercise-training.

Support (if any): Eight Sleep, Inc.

Abstract citation ID: zsad077.0957

0958**USE OF A HYBRID MATTRESS IMPROVES OBJECTIVE AND PERCEIVED SLEEP OUTCOMES**Sharon Danoff-Burg¹, Holly Rus¹, Colin Burke¹, Morgan Weaver¹, Kiara Carmon¹, Devanshi Upadhyaya¹, Duvia Lara Ledesma¹¹ SleepScore Labs

Introduction: Previous research has shown that comfort, including comfort of the sleep surface, is essential to sleep quality. In addition to comfort, the structure and firmness of a mattress may also play a role when it comes to sleep quality. More empirical research is needed to establish the impact of particular

mattresses on both objective and self-reported measures of sleep quality. This study compared sleep on a hybrid mattress to participants' prior sleep on their original mattress.

Methods: Healthy adults (81% female, ages 25-67) who reported sleeping hot participated in a 10-week field study, using a pre-post intervention design. During the 4-week baseline period, participants used their regular mattress at home. During the 4-week intervention period, which occurred following a 2-week adjustment period, they used a Serta iSeries mattress at home. This hybrid mattress includes materials designed to help the user feel cool. Sleep was measured objectively using SleepScore Max every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.

Results: There were over 1,400 nights of tracked sleep across 39 participants. Objective sleep measurements showed increased time in bed (+10 minutes, $p=.001$) and total sleep time (+14 minutes, $p=.002$), as well as increased REM, both in duration (+6 minutes, $p=.004$) and proportion of the night ($p=.023$). Improvements also were observed in two objective sleep quality measures: SleepScore ($p=.002$) and MindScore ($p=.002$). Self-report measures revealed that the hybrid mattress felt cooler ($p<.001$) and more comfortable ($p<.001$). Improvements also were found for a variety of perceived sleep outcomes, including time to fall asleep, waking less often, spending less time awake, longer sleep duration, better sleep quality, and feeling more rested in the morning ($ps<.05$).

Conclusion: Objectively-measured sleep and self-reported sleep improved when using the hybrid mattress compared to healthy adults' original mattresses. Furthermore, qualitative and quantitative self-report results suggested that the intervention was perceived as comfortable and felt cool. These perceptions likely are what led to more time in bed, which in turn led to the key sleep improvements.

Support (if any): Mattress Firm INC

Abstract citation ID: zsad077.0958

0959**USE OF A MEMORY FOAM MATTRESS IMPROVES SLEEP QUALITY AND CONSISTENCY**Sharon Danoff-Burg¹, Holly Rus¹, Colin Burke¹, Morgan Weaver¹, Kiara Carmon¹, Duvia Lara Ledesma¹, Rodolfo Rodriguez¹¹ SleepScore Labs

Introduction: Previous research has shown that comfort, including comfort of the sleep surface, is essential to sleep quality. In addition to comfort, the structure and firmness of a mattress may play a role in sleep quality. More empirical research is needed to establish the impact of particular mattresses on both objective and self-reported measures of sleep. This study compared sleep on a memory foam mattress to participants' prior sleep on their original mattress.

Methods: Healthy adults (65% female, ages 24-59) participated in a 10-week field study, using a pre-post intervention design. During the 4-week baseline period, participants used their regular mattress at home. During the 4-week intervention period, which occurred following a 2-week adjustment period, they used a Sleepy's Memory Foam mattress at home. Sleep was measured objectively using SleepScore Max every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.

Results: There were over 1,000 nights of tracked sleep across 25 participants. Objective sleep measurements showed many nightly improvements during the intervention compared to baseline: less WASO, both in duration (-7 minutes, $p < .001$) and proportion of the night ($p < .001$); fewer awakenings ($p = .002$); and better sleep efficiency ($p < .001$) and sleep maintenance ($p < .001$). Improvement also was observed in SleepScore, a measure of sleep quality ($p = .008$). Self-report measures revealed greater comfort when using the memory foam mattress, as well as improvement in a variety of perceived sleep outcomes, including time to fall asleep, waking less often, spending less time awake after initially falling asleep, longer sleep duration, better sleep quality, and feeling more rested in the morning ($ps < .05$).

Conclusion: Objectively-measured sleep and self-reported sleep improved in quality and consistency when using the memory mattress compared to healthy adults' original mattresses. Furthermore, qualitative and quantitative self-report results suggested that the intervention was perceived as comfortable.

Support (if any): Mattress Firm INC

Abstract citation ID: zsad077.0959

0960

USE OF AN INNERSPRING MATTRESS IMPROVES DEEP SLEEP AND WASO

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Introduction: Previous research has shown that comfort, including comfort of the sleep surface, is essential to sleep quality. In addition to comfort, the structure and firmness of a mattress may also play a role when it comes to sleep quality. More empirical research is needed to establish the impact of particular mattresses on both objective and self-reported measures of sleep quality. This study compared sleep on an innerspring mattress to participants' prior sleep on their original mattress.

Methods: Healthy adults (68% female, ages 23-69) participated in a 10-week field study, using a pre-post intervention design. During the 4-week baseline period, participants used their regular mattress at home. During the 4-week intervention period, which occurred following a 2-week adjustment period, they used a Sleepy's by Sealy mattress at home. Sleep was measured objectively using SleepScore Max every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.

Results: There were over 757 nights of tracked sleep across 18 participants. Objective sleep measurements showed decreased WASO, both in duration (-13 minutes, $p = .024$) and proportion of the night ($p = .025$). Also, there was an increase in deep sleep (+12 minutes, $p = .040$). Self-report measures revealed that the innerspring mattress felt more comfortable ($p < .001$). Improvements also were found for a variety of perceived sleep outcomes, including time to fall asleep, waking less often, spending less time awake, longer sleep duration, better sleep quality, and feeling more rested in the morning ($ps < .05$).

Conclusion: Objectively-measured sleep and self-reported sleep improved when using the innerspring mattress compared to healthy adults' original mattresses. Furthermore, qualitative and quantitative self-report results suggested that the intervention was perceived as comfortable.

Support (if any): Mattress Firm INC

Abstract citation ID: zsad077.0960

0961**APPLYING FRACTAL ANALYSIS TOWARDS THE UNDERSTANDING OF LONG-COVID-INDUCED INSOMNIA**Max Emerling¹, Alexandre Rouen², Jonathan Taieb³,
Dominique Salmon³, Damien Léger²¹ University of California, Berkeley, ² Université Paris Cité, EA 7330 VIFASOM, ³ APHP, Hôtel-Dieu, Centre du Sommeil et de la Vigilance, Paris, France.

Introduction: As part of the recent international COVID Sleep Study-II, long COVID syndrome was found to be associated with chronic insomnia. However, an article submitted for publication out of the Hôpital Hôtel-Dieu found no significant difference between long-COVID-related insomnia and standard insomnia with respect to routine polysomnographic (PSG) parameters. In light of these findings, we seek to better understand the difference between long COVID insomnia and standard chronic insomnia by conducting a fractal analysis of the raw PSG signals of our subjects.

Methods: 15 long COVID patients with complaints of chronic insomnia were included as subjects, as well as 34 matched controls without long COVID who had similar complaints of chronic insomnia. All participants underwent one night of polysomnographic recording. We perform our analysis on movements of the abdomen (as an approximation of deep breathing quality) and on EEG waves, considering that shortness of breath and cognitive dysfunction are commonly associated with long COVID. Building upon an existing repertoire of medical research using the fractal dimension (FD) of patients' signal data to differentiate pathologic and physiologic processes, we make use of Detrended Fluctuation Analysis (DFA) to calculate the FD of the abdomen (FDA) and of an aggregated EEG wave (FDE) for each patient.

Results: We find a decrease in the FDA ($p=0.036$) and increase in the FDE ($p=0.012$) of long COVID insomniacs with respect to those of our control group. These results are shown to be significant after applying a Holm-Bonferroni correction for multiple hypotheses.

Conclusion: Despite our small data sample, an in-depth analysis of PSG signals shows significant differences in the fractal nature of long-COVID-related insomnia with respect to standard chronic insomnia. Our results furthermore match our expectations, given that related research outside of the COVID domain indicates a decrease in the FD of muscle movements and an increase in the FD of EEG waves in unhealthy individuals. Further research could employ more participants in order to extend our results to other data channels outside of EEG signals and the abdomen.

Support (if any):

Abstract citation ID: zsad077.0961

0962**DEPRESSION AND SLEEP HEALTH IN A NATIONWIDE SURVEY: IMPLICATIONS FOR DEPRESSION THERAPY DURING THE COVID-19 PANDEMIC**Maurice Chery¹, Amrit Baral¹, LaShae Rolle¹, Maritza Bernard²,
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Girardin Jean-Louis³, Azizi Seixas¹, Judite Blanc¹¹ University of Miami Miller School of Medicine, ² Saint Leo University, ³ University of Miami

Introduction: Sleep disturbances are linked to detrimental health outcomes, including mental health and cardiovascular health. A bidirectional relationship between depression and sleep health

is well documented in the literature. However, little is known regarding which sleep health dimensions is associated with depression. The purpose of this study is to investigate the relationship between depression and multiple sleep health dimensions; more specifically sleep duration and insomnia symptoms among US adults from January to December 2020.

Methods: We analyzed data from the 2020 National Health Interview Survey (NHIS) conducted among a representative sample of 31, 568 adults. First, we used binary logistic regression models to examine the association between self-reported diagnosis of depression and insomnia variables. Then, a multinomial regression assessed the association between depression symptoms and sleep duration. Our models statistically adjusted for sociodemographic factors (age, sex, marital status), health risk behaviors (smoking and alcohol use status), race/ethnicity, general health condition.

Results: The mean age was 53.50 [± 18.04] years. Women represented 54% of the sample and twice as likely to report depression symptoms (67.51 vs 32.49, $p < 0.001$) relative to men. Binary logistic regression indicated that participants with symptoms of depression had higher odds of having difficulty staying asleep (OR:1.58; 95%CI: 1.43-1.74, $p < .0001$), difficulty falling asleep (OR:1.46; 95%CI: 1.30-1.62, $p < .0001$), and feeling unrested (OR:1.70; 95%CI: 1.50-1.93, $p < .0001$) respectively. Multinomial logistic regression showed that participants with symptoms of depression reported higher odds of having both short sleep (≤ 6 hours) (OR: 1.10; 95% CI: 1.0-1.21, $p=0.0424$) and long sleep (> 9 hours) (OR: 1.72; 95% CI: 1.50- 2.0, $p < .0001$).

Conclusion: Our research is among the first to confirm strong associations between depression and several dimensions of sleep in the US general population during US COVID-19 pandemic. Our findings underline the importance of sleep health in treating depression as the nation battles the current mental health crisis.

Support (if any): Funding sources: R01HL152453-01 R01HL142066, R01HL095799, R01MD004113

Abstract citation ID: zsad077.0962

0963**EVERYDAY DISCRIMINATION IS ASSOCIATED WITH SLEEP-RELATED IMPAIRMENTS AMONG BLACKS DURING THE COVID-19 PANDEMIC**Ana Gabriela Sanchez Alfonso¹, Judite Blanc¹, Bruno Oliveira¹,
Maurice Chery¹, Clarence Locklear¹, Azizi Seixas¹,
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Introduction: Sleep is influenced by a set of multilevel factors including race and ethnicity. There is overwhelming evidence supporting that sleep quality is poorer within nonwhite groups. Race-based stressors and discrimination are believed to be among the logical explanation of these widespread racial/ethnic disparities in sleep health. This study aimed to highlight the effects of discrimination on sleep related impairments among Black adults.

Methods: Our sample included 280 Blacks and African Americans enrolled in two NIH-funded community-based sleep studies: ESSENTIAL and MOSAIC. Participants were recruited between January 2020 and April 2022 in the New York City or Tri-State area ($n=101$; 36%) and South Florida ($n=179$; 64%). Data were gathered on demographics, sleep disturbance, activity, stress, and support using the Insomnia Severity Index (ISI),

PROMIS Sleep-Related Impairment (SRI) questionnaire (short form 8a), Godin Leisure-Time Exercise questionnaire, Everyday Discrimination Scale, stressful life events experienced within the past year, and the Multidimensional Scale of Perceived Social Support (MSPSS). Correlation analyses were conducted among continuous variables to explore associations among sleep, activity, support, discrimination, and stress. Controlling for age, race/ethnicity, and sex, multilinear regression analysis was conducted to examine the relationship between stressful life event exposure, discrimination, social support, and activity on sleep impairment. **Results:** Of the 280 participants, 63% were female ($n = 177$) and the mean age was 43.4 years. A total of 36% ($n = 101$) were from the New York City/Tri-State area, while 64% ($n = 179$) were from the South Florida region. Controlling for age, race/ethnicity, physical activity, non-race related stressors, social support, and sex, everyday discrimination was the strongest predictor of sleep related impairments (SRI) [$\beta = -0.198$, $p < 0.05$]. Sex was positively associated with SRI scores [$\beta = 0.167$, $p = 0.05$]. On average, women reported higher SRI scores.

Conclusion: In this study, we found that among Blacks and African Americans in the New York City, Tri-State areas, and South Florida areas, during the Covid-19 pandemic, greater discrimination experience was associated with higher level of sleep-related impairments.

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0964

ANXIETY AND POOR SLEEP QUALITY ARE ASSOCIATED WITH CORTISOL IN UNIVERSITY STUDENTS DURING THE COVID-19 PANDEMIC

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Introduction: Students experience a disproportionate amount of stress. The COVID-19 pandemic exacerbated and introduced stressors rarely encountered by students, including quarantining, and switching to remote learning. Psychological stress, mood, and sleep issues are known to have a negative effect on a variety of physiological biomarkers of stress, especially cortisol and a less studied marker, dehydration, (e.g., urine specific gravity levels (USG)).

Methods: This cross-sectional study examined associations between psychological and physiological markers of stress in university students during the latter part of the COVID-19 pandemic. Students completed online questionnaires on stress, depression, anxiety (DASS-21), and sleep quality (PSQI), followed by home collection of saliva (8 samples for 2 days) and urine (first catch). Three cortisol indices were evaluated: CAR, diurnal slope, and AUCg. Urine specific gravity was assessed as a marker of dehydration. Bivariate correlations assessed associations and independent t-tests were used to compare the 25th and 75th percentiles on cortisol indices and dehydration levels.

Results: A total of 43 female students (22.7 ± 6.9 years old) completed the study. Levels of depression (70.7%), anxiety (75.8%), stress (90.2%) fell in the normal range. Sleep quality was poor (9.4 ± 2.8), but TST = 7.74 ± 1.2 hours and SE = $88.1 \pm 1.0\%$. About 20% had symptoms of insomnia. There was a significant difference in AUCg between the 25th and 75th percentile of anxiety ($t = -1.90$, p

= .037; 154.26 ± 17.0 vs 228.12 ± 35.0 , ug/dL) indicating those with highest levels of anxiety had higher overall diurnal cortisol than those with lowest levels. Sleep quality was also significantly associated with AUCg. Those with poor sleep (PSQI > 5) had higher cortisol levels than those with good sleep ($t = -2.17$, $p = .019$; 236.4 ± 21.2 vs 120.1 ± 10.6 ug/dL). There were no significant associations between the psychological measures and USG levels.

Conclusion: Findings suggest that while stress, depression, and anxiety levels may have leveled off 1 ½ years into the pandemic, those with residual high anxiety and poor sleep quality may continue to be at risk for poor health due to high levels of cortisol.

Support (if any):

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0965

CHANGES IN SLEEP STATUS AND THE EFFECTS OF OBESITY INDEXED BY SEX BEFORE AND AFTER COVID-19: A 2-YEAR FOLLOW-UP COHORT STUDY

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Introduction: The COVID-19 pandemic has changed people's lifestyles. This study aimed to examine the changes in sleep status before and after COVID-19 according to sex in middle-aged Koreans, and investigate the effect of sleep status on obesity indicators.

Methods: This prospective cohort study was the Korean Medicine Daejeon Citizen Cohort study and included participants aged 30-59. A baseline survey was conducted from 2017 to 2019 before COVID-19, and a follow-up survey from 2020 to 2021 after the outbreak of COVID-19. This study analyzed the data of 1436 people, with 422 males and 1014 females completing follow-up. Using the Pittsburgh Sleep Quality Index (PSQI) questionnaire with validity, we evaluated sleep, sleep duration, sleep quality score, and group (categorized into good sleep and poor sleep, based on a PSQI score of 5). Body mass index (BMI), waist circumference (WC), body fat mass (BFM), and percent body fat (PBF) were measured to determine obesity indices. For changes in sleep status before and after COVID-19, Fisher's exact test and Paired t-test were conducted. ANCOVA was performed to determine changes in the obesity index according to sleep quality groups in the baseline survey, which was age-adjusted. All analyses were stratified by sex.

Results: Sleep duration decreased significantly by 13.88 minutes for males and 11.23 minutes for females to 6.54 hours (SD=1.2) and 6.48 hours (SD=1.2), respectively. Sleep quality scores increased by 1.03 points and 0.7 points for males and females, respectively, to 5.2 points and 5.7 points, respectively. The distribution of poor sleep increased from 25.6% before COVID-19 to 38.6% after COVID-19 for males ($p < 0.001$), and from 36.5% before COVID-19 to 43.1% after COVID-19 for females ($p < 0.001$). Significant changes in the obesity index were observed according to the sleep quality group only in males. In the male poor PSQI group, WC ($\Delta 3.4$ cm), BFM ($\Delta 1.3$ kg), and PBF ($\Delta 1.2\%$) increased significantly more than those in the good PSQI group indices changes.

Conclusion: COVID-19 has negatively impacted sleep, and such sleep changes have contributed to an increase in the obesity index for males.

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0966

CORRELATION OF SLEEP-RELATED HABITS AND COVID-19 TO PEDIATRIC RESIDENTS ITE SCORES

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Introduction: Inadequate sleep negatively affects decision-making. The extent to which it may affect medical residents' performance on the In-Training Examination (ITE) is unclear. Research from Weeks et al., 2021 showed that each hour of sleep a medical resident received prior to the ITE, increased their odds of scoring over 70% on the exam by 25%. A typical resident sleeps six hours a night, which is less than the recommended seven to nine hours a night. Associations between COVID-19 and sleep disorders are more prevalent among healthcare workers. We aim to correlate pediatric residents' habits and COVID-19 status with their 2022 ITE scores.

Methods: A cross-sectional, 10-question, electronic, and anonymous survey was sent to the pediatric residents (N=74) in our program. Fisher's exact test was used to assess the correlation between ITE score less than 70% and rotation at the time of the exam, COVID-19 status, caffeinated beverages, and exercise. Linear regression model was used to analyze the impact of these variables on ITE scores. All statistical tests were two-sided, and $p < 0.05$ was considered statistically significant. Our methods were limited by a small sample size and recall bias.

Results: A total of 37(50%) residents completed the survey and were included in the analysis. Of those residents, 27(73%) sleep 6-7 hours/night, 9(24.3%) use melatonin regularly, and 23(62.2%) drink caffeine daily. Residents diagnosed with COVID-19 before the 2022 ITE scored significantly lower on the ITE. (-12.1, 95% CI[-23.9, -0.27], $p=0.045$. There was not any significant association between ITE score less than 70% and rotation ($p=0.79$), caffeinated beverages ($p=0.41$), and exercise ($p=0.99$).

Conclusion: ITE scores of pediatric residents in our program were not significantly influenced by exercise, caffeine consumption, or rotation at the time of the exam. Interestingly, residents who tested positive for COVID-19 before the 2022 ITE displayed significantly lower scores. This finding is in line with a limited number of prior studies pointing to possible long-term cognitive consequences associated with this infection. To better understand this association, we suggest a larger study incorporating sleep hours the night before the exam and COVID status.

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0967

DO PRE-EXISTING SLEEP DISORDERS WORSEN LONG COVID FATIGUE AND BRAIN FOG?

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Introduction: Long COVID is common after COVID-19 infection and leads to functional limitations with most reporting substantial symptom burden from fatigue. Symptoms in sleep disorders are attributed to inflammatory dysregulation and may predispose to fatigue expression. We hypothesize prior diagnoses of sleep disorders are associated with severity of long COVID fatigue.

Methods: A retrospective EMR review was performed of 210 consecutive adult patients (9/2021 to 2/2022) referred at least 3 months after COVID-19 infection seen in a new community-based long COVID clinic. The intake process collected demographics, past medical history, functional questionnaires, and symptom checklists. Primary outcome was Fatigue Severity Scale (FSS) score. Sleep disorders were evaluated as a composite of self-reported insomnia, sleep disordered breathing, and restless legs syndrome as well as subset analyses of each disorder. Secondary outcome was physical functioning measured by ECOG performance scale. Linear analyses were used for FSS and ECOG analyses. Adjustors included age, sex, body mass index (BMI), and whether patient had COVID-19 hospitalization.

Results: Cohort was female (66.2%), aged $51.6 \pm SD 14.4$ yrs, BMI 29.8 [IQR 26.2, 37.7]. Prior chronic insomnia was present in 9%, sleep disordered breathing in 23%, and RLS in 4%; the pooled history of sleep disorders was 30%. Fatigue was reported in 76% with mean FSS score of 5.44 [interquartile range, IQR: 4.11, 6.44]; 48% reported brain fog. The interval between acute COVID infection and clinic evaluation was 10.4 ± 5.34 months and had no association to FSS severity ($r = 0.07$, $p = 0.30$). Sleep disorders in aggregate, insomnia, and restless legs syndrome had no associations with fatigue or functional status. Sleep disordered breathing had an association to fatigue in unadjusted ($\beta = 0.68$, 95% confidence interval, [CI]: 0.13, 1.24), but not adjusted models ($\beta = 0.53$, 95%CI: -0.06, 1.13). Sleep disorders both in aggregate and evaluated individually had no associations to brain fog.

Conclusion: A prior history of sleep disorders contributed little to post-COVID fatigue reported in those presenting to a community-based Long COVID clinic.

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0968**RELATIONSHIP BETWEEN BREAKTHROUGH COVID-19 INFECTIONS IN VACCINATED PATIENTS AND SLEEP DISTURBANCES**Mantavya Punj¹, Aakash Desai², Jana Hashash¹, Francis Farraye¹, Pablo Castillo¹¹ Mayo Clinic Florida, ² MetroHealth Medical Center, Case Western Reserve University

Introduction: The COVID-19 pandemic caused by SARS-CoV-2 continues to result in significant morbidity and mortality on a global scale. Prior studies have examined the effectiveness of non-COVID vaccines in setting of sleep disturbances. This study evaluated data from a large national database to examine the relationship between the risk of breakthrough COVID-19 infections in patients with certain sleep related disturbances.

Methods: Real-time search and analysis using the TriNetX platform to evaluate risk of COVID-19 breakthrough infections (BTI) for patients having ICD-10 diagnoses relating to insomnia, circadian rhythm disorders, and inadequate sleep. The sleep disorder and control cohorts underwent propensity matching including factors for age, gender, race, ethnicity, and multiple co-morbid conditions.

Results: Of 24,720 patients identified as having a sleep disturbance relating to insomnia, circadian rhythm disorder, or inadequate sleep, 815 (3.2%) were found to have developed a BTI. There was a significant increased risk of BTI noted between the sleep disorder and control cohorts (adjusted odds ratio (aOR) of 1.40, 95% confidence interval (CI) of 1.23-1.58). Subgroup analysis showed an elevated risk for BTI receiving two doses (aOR 1.53, 95% CI 1.24 – 1.89) versus three doses (aOR 1.45, 95% CI 1.24 – 1.69). Patients with the sleep disturbance were not found to be at an increased risk of hospitalization, intubation, death, or composite outcome of death and intubation.

Conclusion: The presence of having a diagnosis of insomnia, circadian rhythm disorder, or inadequate sleep was associated with increased risk of COVID-19 breakthrough infection.

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0969**SEVERE PERSISTENT SPECIFIC SLEEP DISORDERS IN POST-ACUTE SEQUELAE OF SARS-COV-2**Richard Czuma¹, Robert Thomas¹, Jason Maley², Danielle Gott¹¹ Beth Israel Deaconess Medical Center, ² Harvard Medical School

Introduction: Viral infections have long been associated with sleep disorders, especially hypersomnia following the acute phase. The Covid-19 epidemic has resulted in a post-viral syndrome called post-acute sequelae of SARS-CoV-2 (PASC), or Long-Covid. Sleep has been reported to be severely disturbed during acute Covid-19 infection, and is a major feature of PASC. Much of the subjective data is based on questionnaires, with a paucity

of objective sleep evaluations including polysomnography. We share our early experience with diagnosis and management of sleep disorders in PASC.

Methods: PASC patients are seen in a dedicated Long-Covid clinic at the Beth Israel Deaconess Medical Center for a comprehensive evaluation. The patients presented with new onset persistent sleep impairments shortly following acute COVID-19 infection, without pre-existing sleep impairments, in association with a clinical diagnosis of long covid. Sleep symptoms (excessive sleepiness, hypersomnia/long sleep, and insomnia) are identified and those who consider these a key symptom are referred to the Covid Sleep Clinic, for formal sleep evaluation by RJT. Diagnostic evaluations include polysomnography (extended for hypersomnia diagnosis), Multiple Sleep Latency Test for excessive daytime sleepiness, and home sleep apnea test for suspected sleep apnea. Sleep logs and sleep quality using a Ring oximeter-based SleepImage system complements evaluation of sleep-wake instability. Standard management is offered based on the ensuing diagnosis.

Results: Twenty-six patients (age range 22 to 58 years, 16 females) have been evaluated in this sleep pathology enriched pathway. Specific new sleep disorders diagnosis so far have included narcolepsy without cataplexy (3), hypersomnia with long sleep (3), hypersomnia without long sleep (3), rapid eye movement sleep disorder (2), persistent insomnia (3), a sleep-wake instability syndrome we call cyclical insomnia (2), and sleep apnea (7). Treatment has included CPAP, stimulants, modafinil, and sodium oxybate. Clinical responses to treatment have so far been as expected. One patient with cyclical insomnia has had a marked subjective and objective improvement with low dose (250 mg) sodium valproate.

Conclusion: PASC/Long-Covid can induce specific sleep syndromes. These include narcolepsy, hypersomnia, persistent insomnia, sleep-wake instability, and REM-behavior disorder.

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0970**THE IMPACT OF THE COVID-19 PANDEMIC ON HEALTHCARE ACADEMICIANS' SLEEP QUANTITY AND QUALITY**Kait Macheledt¹, Jerica Berge¹, Sade Spencer¹, Snigdhasmrithi Pusalavidyasagar¹¹ University of Minnesota Medical School

Introduction: The COVID-19 pandemic globally disrupted workplaces, including at academic institutions. Many clinical and research activities were paused and, when clinics and laboratories reopened, operations and workflows had changed. These changes were often stressful. We examined the changes in the quality and quantity of sleep for University of Minnesota health sciences faculty to understand the impact of these disruptions.

Methods: A cross-sectional survey of 291 University of Minnesota health sciences faculty was conducted over the

months of April-June 2021 aimed at gaining insight into their lived experiences during the COVID-19 pandemic. The survey included validated measures and general questions developed using survey best practices. Information on personal demographics (gender, race, caregiver status etc.), academic demographics (rank, track, school, etc.), reflective sleep quantity (e.g. hours) and reflective sleep quality were collected through self-report. Associations between gender (e.g. men/women), sleep quantity and quality pre-COVID-19 and during COVID-19 were examined using summary statistics as well as the chi-square test and T-test with statistical significance set to < 0.05 .

Results: In general, the study population reported fewer hours of sleep since the COVID-19 pandemic began ($\mu=6.96$) in comparison to before the COVID-19 pandemic ($\mu=7.23$), $t(285) =$

-5.04 , $p<.001$, 95% CI $[-0.37, -0.16]$. Survey respondents also reported that their quality of sleep was “moderately” restful ($N=160$) prior to the pandemic but only “somewhat” restful ($N=120$) during the pandemic, $\chi^2(9)=123.59$, $p<.0001$. Demographics (gender and race), caregiver status, and academic attributes (rank, track, school) will be reported.

Conclusion: The COVID-19 pandemic impacted academicians’ sleep quality and quantity. Understanding these changes is important for promoting wellbeing and resilience in academic healthcare.

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0971

CASE REPORT: SLEEP-RELATED PAINFUL ERECTIONS TREATED WITH SODIUM OXYBATEHira Chaudhary¹, Eric Zeidman², Nahid Punjani², Yasemin Tashman²¹ Mayo Clinic in Arizona, ² Mayo Clinic Arizona

Introduction: Sleep-related painful erection (SRPE) is a rare parasomnia characterized by painful penile erections during rapid eye movement sleep. Normal, painless erections continue to occur while awake. Approximately thirty cases have been reported in the literature. Multiple theories about potential pathophysiology have been proposed including neurologic dysfunction of the ischiocavernosus and bulbocavernosus, correlation with obstructive sleep apnea, and/or autonomic dysfunction. There is no known single effective treatment to date resulting in durable response despite multiple attempts at therapy.

Report of case(s): A 39-year-old male presented with SRPE. This started in 2018 and occurred in the second half of the night every twenty minutes, contributing to discomfort and poor sleep quality. While awake, his erections were painless. He was prescribed baclofen at doses up to 30mg daily decreasing episode frequency to 1-6 times per night, but disabling somnolence precluded continuation. Pelvic physiotherapy was unhelpful while imipramine and clonazepam provided partial relief. Tadalafil was ineffective and cinitapride was not available in the United States. Oxycodone used for pain after a motor vehicle accident did effectively treat him for five hours per night, so morphine was trialed. This was effective for two weeks, but symptoms returned. In April 2022, he was begun on sodium oxybate. With an initial dose of 2.25 g twice nightly, symptoms were treated for four hours a night. After increasing to 2.75 g twice nightly, the SRPE was effectively treated. As of September 2022, he is taking sodium oxybate 3 g at bedtime, 3 g 3.5 hours later and the final 3 g at the 7th hour, promoting 9.5 hours of sleep without SRPE.

Conclusion: This 39-year-old male who presented with SRPE was trialed on multiple therapies without success, and ultimately successfully treated with an appropriate and titrated dose of sodium oxybate. This may represent a new treatment option, which we hypothesize may act by modulating GABA to result in relaxation of the bulbospongiosus and ischiocavernosus muscles. Further studies should include the study of both the efficacy of this drug for SRPE as well as potential mechanisms of action.

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0972

THE UTILITY OF CSF OREXIN TESTING IN INVESTIGATING FOR NARCOLEPSY TYPE-1 IN A PATIENT WITH DIENTEPHALIC MASSChristopher Cheng¹, Alon Avidan¹¹ UCLA

Introduction: Narcolepsy type 1 (NT1) is characterized by pathologic hypersomnolence, REM intrusion phenomena, including cataplexy, and orexin deficiency. The diagnosis of NT1 is established based on the presence of bone fide cataplexy and

supportive PSG and MSLT testing which requires patients to achieve sufficient sleep duration and regularity and discontinue centrally acting medications that might alter REM sleep. In cases where there is a high index of suspicion for NT1, CSF orexin deficiency is helpful to support the diagnosis of NT1. This is particularly true when PSG-MSLT are not feasible, CNS medication cannot be discontinued, or cataplexy cannot be validated.

Report of case(s): A 16 year old girl presented for evaluation of excessive daytime sleepiness in the setting of suprasellar germinoma which was resected and treated with chemoradiation at age 11. She subsequently developed panhypopituitarism and severe hypersomnolence in the setting of sleep-wake schedule irregularities, variability of sleep duration, refractory delayed sleep phase disorder, and snoring. She reported episodic weakness in the setting of negative triggers, which was atypical for cataplexy. Her medications included modafinil, amphetamine-dextroamphetamine, and the SSRI fluoxetine. Physical examination depicted normal airways. Epworth Sleepiness Scale score was 18. Screening polysomnography showed a sleep efficiency of 78%, sleep latency of 46.5 minutes, REM latency 2 hours, AHI of 0/hr, and periodic limb movements of 35/hr without arousals. While the REM latency on polysomnography was inconsistent with NT1, the clinical history of a diencephalic mass and chemoradiation was suggestive of secondary NT1. She was unable to proceed with PSG-MSLT due to her psychiatrist's advice against discontinuing her SSRI and her difficulty in maintaining sleep-wake regularity. An evaluation for CSF orexin was performed establishing a normal level of 337 pg/mL (reference level of 200 pg/mL in healthy individuals), ruling out orexin deficiency /narcolepsy type 1. The patient was subsequently improved with wake-promoting antidepressants and light therapy in the AM.

Conclusion: This case illustrates the value of CSF orexin testing in the setting of diencephalic lesions in patients unable to undergo formal narcolepsy testing.

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0973

HGNS SENSING LEAD DAMAGE AFTER 3D MAMMOGRAM REQUIRING HGNS IPG AND LEAD RE-IMPLANTATIONAnand Srikrishnan¹, Katie Tran²¹ Department of Neurology, University of Texas Southwestern Medical Center, ² UT Southwestern Medical Center

Introduction: Obstructive sleep apnea (OSA) is associated with excessive daytime sleepiness, nocturnal hypoxemia, and daytime fatigue. Standard therapy is with positive airway pressure (PAP) therapy. If this is unsuccessful or poorly tolerated, a hypoglossal nerve stimulator (HGNS) can be surgically implanted for treatment. The goal of HGNS treatment is to advance the tongue with each respiration during sleep to relieve oropharyngeal obstruction causing OSA. This therapy has been shown to be efficacious and well tolerated for moderate to severe sleep apnea with a low complication rate.

Report of case(s): A 61 year-old female with history of obesity and severe OSA presented to the sleep clinic with complaint of excessive daytime sleepiness and persistently elevated apnea-hypopnea index (AHI) of 42 events/hour despite adequate usage of CPAP therapy. She underwent an HGNS placement for treatment. Following HGNS activation she used it nightly and three months after implantation underwent an HGNS titration study which was successful (AHI 5.7) and the patient was started on

optimal treatment settings with resulting resolution of OSA symptoms. After a period of successful device usage, she presented for follow up and reported complaints of excessive fatigue and sleepiness that was sudden. She attributed these changes to a 3D mammography study she underwent for breast cancer surveillance. Repeat home sleep apnea testing showed sudden worsening of her AHI to 50.6. During a thorough investigation of her device, HGNS sensing waveforms indicated possible sensing lead fracture. The patient was taken to the operating room for implanted pulse generator removal and replacement with new sensing and stimulation leads. Intra-operatively, it was noted that the distal sensing lead had several tears of the polyurethane insulation near the hub of the sensor. Following successful re-implantation sensing returned to normal and she has continued HGNS treatment.

Conclusion: We present a case of an unusual complication of HGNS sensing lead damage following a 3D mammography study. This led to surgical exploration with removal of a torn sensing lead and re-implantation of the HGNS generator and leads. Attention should be brought to patients and providers in the future regarding this rare, but potentially serious complication.

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0974

LIMITATIONS OF HYPOGLOSSAL NERVE STIMULATION IN PATIENTS WITH DOWN SYNDROME

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Introduction: Obstructive sleep apnea (OSA) is a common sleep disorder affecting up to 80% of people with Down Syndrome (DS). Tonsillectomy and adenoidectomy (T&A) are commonly utilized as the first line of treatment of OSA in patients with DS. However, even after T&A, OSA can persist in up to 60% of patients. Positive airway pressure (PAP) compliance is low in patients with DS, limiting treatment efficacy. Hypoglossal nerve stimulation (HNS) is FDA-approved for the treatment of select adult patients with OSA. Limited research is available on HNS in people with DS; however, the limited data suggests that HNS may be a safe and effective treatment in this patient population. We describe two cases of patients with DS and HNS with unique challenges with treatment.

Report of case(s): Case 1: A 36-year-old male with a history of DS presented for follow-up after activation of the HNS. The patient had been living part-time in a group home. While the patient's mother thought he was using HNS every night, the download from the remote showed 41% usage over a three-week time frame. With further investigation, it was determined that the device was turned on the nights when the patient was at home with his parents, but not when he was at the group home despite detailed caregiver education. Case 2: A 19-year-old male with OSA and DS returned for a follow-up of his HNS. Upon exam, the patient's HNS was already "on" in clinic, which the mother

was unaware of. Download from the remote showed a usage time of 13+ hours, and the HNS was commonly "on" into the afternoon well after the patient had left for school in the morning, indicating that the HNS was commonly left on while the patient was awake. Despite significant education, the caregiver was not correctly turning the HNS off.

Conclusion: HNS offers a therapeutic alternative in patients with DS, who are refractory to T&A and PAP. The success of the treatment is dependent on multiple factors, including therapy mechanics, patient tolerance, and caregiver education/compliance. Additional caregiver instruction may be necessary to ensure optimal use.

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0975

SEVERE CENTRAL SLEEP APNEA AFTER BILATERAL LUNG TRANSPLANTATION

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Introduction: Central sleep apnea (CSA) is characterized by repetitive disruptions in airflow during sleep due to impaired central respiratory drive. Multiple studies have described an increased incidence of sleep disordered breathing after lung transplantation. However, these studies implicate obstructive sleep apnea as the primary sleep disturbance related to post-transplant weight gain, increased neck circumference, and fluid retention from immunosuppressive therapy. We report an uncommon presentation of new onset severe central predominant sleep apnea in a bilateral lung transplant recipient.

Report of case(s): A 61-year-old female with a history of end stage COPD with chronic hypoxic respiratory failure status post bilateral lung transplantation in 2020 presented to sleep medicine clinic with several months of witnessed apneic episodes, excessive daytime sleepiness, morning headaches, and insomnia. Physical exam was notable for an increased body mass index (BMI) of 35 kg/m² from pre-transplant BMI of 29 kg/m². Epworth Sleepiness Scale was 15, compared to 4 prior to transplant. Polysomnogram showed an apnea hypopnea index (AHI) of 94.5 events/hour with central AHI of 54.6, consistent with severe central predominant sleep apnea. Titration on CPAP at 5 cmH₂O and 7 cmH₂O improved the AHI to 13.3 and 20.3, respectively, with residual central hypopneas. On follow-up, downloaded therapy data revealed a residual AHI of 23.3 on CPAP at 5 cmH₂O and 1.5 L/min O₂, suggesting the need for a BiPAP/ASV titration study if control remains suboptimal.

Conclusion: Common etiologies of CSA include heart failure with Cheyne-Stokes respirations, neurologic disease, high altitude, and the use of centrally acting medications. This patient did not have clearly identifiable risk factors. Pre- and post-transplant echocardiograms showed preserved left ventricular function with no regional wall motion abnormalities. She lacks history of neurologic disease or narcotic use, and her current immunosuppressive regimen has not been linked to worsened sleep apnea. Proposed pathogenesis of CSA in lung transplant recipients include abnormalities in respiratory mechanics due to pulmonary denervation and altered chemoreceptor sensitivity. Prompt diagnosis and treatment of sleep disordered breathing is crucial in organ transplant recipients to prevent adverse cardiovascular outcomes. Thus, further investigation is warranted

to better characterize the changes in respiratory parameters that occur after lung transplantation.

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0976

CENTRAL SLEEP APNEA (CSA) FOLLOWING TREATMENT WITH NON-POSITIVE AIRWAY PRESSURE (PAP) MODALITIES

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Introduction: Emergence or worsening of CSA following non-PAP therapies has not been well studied. We present two cases of CSA following treatment of OSA; one with mandibular advancing device (MAD) and other with hypoglossal nerve stimulation (HGNS).

Report of case(s): Case 1: A78 y/o male presented with CPAP intolerance and seeking HGNS for OSA treatment. His AHI was 25 with an O2 nadir of 76%. Following a comprehensive evaluation including sleep endoscopy, he was deemed a good candidate for HGNS. Per protocol, his HGNS was activated, PSG done after an interval period during which his stimulation was titrated from 0-2.3V. His AHI remained elevated (50 – 163) at all voltage settings with emergence of CSA at 2.3 & 2.4 V. Due to tongue discomfort, his stimulation parameters were changed and HSAT was done to re-assess his breathing. Home study showed persistent severe sleep apnea- central & obstructive with periodic breathing and desaturations to 70s. Case 2: A 28-y/o male with OSA AHI of 20.2 and O2 nadir of 82%. He was intolerant of CPAP; hence MAD was pursued. PSG done showed MAD was ineffective as his AHI was elevated at 26.8 with elevated CAI (associated with desaturations). A repeat study at home was done following adjustments to the MAD showed a higher index with pAHI of 37.7, predominantly central in nature with periodic breathing. Patient is awaiting a CPAP titration but has returned back to PAP therapy with good tolerance and resolution of his residual symptoms including daytime hypersomnolence.

Conclusion: These two cases highlight that CSA can be associated with non-PAP therapies and symptomatic improvement alone may not be an effective approach. Testing following initiation of treatment would allow for more effective management especially when patient is symptomatic or treatment is suspected to be ineffective.

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0977

BILATERAL THALAMIC STROKES PRESENTING AS ACUTE HYPERSOMNIA

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Introduction: Acute hypersomnia is a rare presentation of bilateral paramedian thalamic strokes (PTS). The typical symptoms of vertical gaze palsy, memory impairment, and even coma, do not include acute hypersomnia. Hypersomnia can be normal in appropriate settings. However, acute hypersomnia from a wake state is abnormal and should alert observers to a potential stroke, making timely intervention consequential to patient's outcome.

Report of case(s): A 59-year-old right-handed female, who was a passenger in a car, suddenly fell asleep and started snoring. Her sister, as the driver, was not able to arouse her. The patient was taken to the Emergency Department for further evaluation. Initial head CT was normal. Follow up MRI of the brain demonstrated bilateral PTS with extension to rostral midbrain (Axial images are available with DWI/ADC windows). Throughout her five-day-hospitalization, she remained somnolent without improvement. Her neurological exam was significant for decreased alertness, impaired short-term memory recall, vertical gaze palsy, and difficulty with two-step commands. She had no focal weakness or numbness. Electroencephalogram (EEG) showed generalized theta slowing background without seizure or epileptiform discharges. Cerebral and neck vessel images, cerebrospinal fluid studies, echocardiogram, and hypercoagulable tests were normal. Outpatient workup revealed atrial fibrillation, which was the strokes' presumed etiology. She was also diagnosed with obstructive sleep apnea (Apnea-Hypopnea Index of 9.6) and was treated with CPAP. Despite compliance, her hypersomnia (Epworth Sleepiness Scale of 24) and cognitive dysfunction persisted, making a resumption of her prior employment not feasible. Bilateral PTS commonly stem from the artery of Percheron (AOP), which is a rare vascular variation where a single artery arises from the posterior cerebral artery to supply both thalami and midbrain.¹ Ischemic disruption of the thalami's dual role in sleep-wake regulation can lead to decreased daytime arousal and increased nighttime sleep disturbance with subsequent hypersomnia.^{2,3} Vertical gaze palsy is due to disruption of descending pathway of vertical gaze center.

Conclusion: Bilateral PTS have deleterious long-term clinical consequences. Increased recognition of acute hypersomnia as the presenting symptom for PTS can enhance acute stroke treatment with tPA and/or mechanical thrombectomy, and thereby improve the odds for recovery.

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0978

I CANNOT STAY STILL - A CASE OF SLEEP-RELATED RHYTHMIC MOVEMENT DISORDER

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Introduction: Sleep-related rhythmic movement disorder (SRRMD) is characterized by repetitive rhythmic motor behaviors involving large muscle groups that occur predominantly during stage N1 sleep. SSRMs are common in infants and children but they usually spontaneously resolve before adolescence. This case presents a rare adult case of SRRMD.

Report of case(s): A 60-year-old man initially presents to clinic for evaluation of repetitive movements needed to initiate sleep. Patient reports the problem starting in his childhood, where he needs to rock and roll intentionally in bed to fall asleep. He had been prescribed clonazepam 2mg and had been taking this along with doxylamine and melatonin nightly, but still reports frequent nocturnal awakenings due to body rolling. He specifically denies any hypnic kicking/jerking, or discomfort in legs while falling asleep. Patient has no excessive alcohol consumption, marijuana, or illicit drug use. Differentials for the patient's condition include hyperarousal, chronic anxiety, iron deficiency, sleep-related breathing disorder, and rhythmic movement disorder. Patient consequently underwent an in-lab diagnostic polysomnography

study which showed no evidence of sleep-related breathing disorders with AHI of 1.6 (AASM 3%). Sleep efficiency was low at 60.8% and sleep architecture showed decreased REM sleep and decreased N3 sleep. Rhythmic movements were noted during sleep and it was manifested by excessive transient muscle activity in both limb & chin EMG leads and also whole body rocking in the video recording. Moderate periodic limb movements were noted with PLM index to 17. Patient was seen in clinic 6 months later with persistent symptoms and his dose of clonazepam was increased slowly to 2.5 mg and then 3 mg. On the 3 mg of clonazepam, patient had resolution of symptoms.

Conclusion: Our case describes a patient who had SRRMs that commenced in childhood persisting well into adulthood. Reported adult cases of SRRMD are few, and have been associated with sleep apnea, REM sleep behavior disorder, and RLS, while many remain idiopathic such as the case with this patient. While benzodiazepines are still first line for SRRMD, further work up and investigation into possible comorbid conditions could yield insight into the etiology and offer alternative treatment options to patients.

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0979

OBSTRUCTIVE SLEEP APNEA IN A PATIENT WITH CEREBELLAR ATAXIA WITH NEUROPATHY AND VESTIBULAR AREFLEXIA SYNDROME (CANVAS)

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Introduction: Cerebellar ataxia with neuropathy and vestibular areflexia syndrome (CANVAS) is a rare disorder caused by an autosomal recessive biallelic pentanucleotide repeat expansion in the replication factor C subunit 1 (RFC1) gene. Clinical features include gait disturbances, impaired vibratory sensation, autonomic dysfunction, cough, and slow disease progression. Spinocerebellar ataxias are frequently associated with sleep disturbances, including REM sleep behavior disorders, insomnia, obstructive sleep apnea (OSA), and central sleep apnea. This is thought to be secondary to involvement of several nervous system structures including the cerebellum. OSA is caused by repeated obstruction of the pharyngeal airway leading to sleep disturbances and fatigue. It is likely that cerebellar insults such as CANVAS may play a role in upper airway obstruction and resultant OSA. However, there is little characterization of this relationship in the medical literature.

Report of case(s): We report a case of a 52-year-old female with a past medical history of CANVAS, anxiety, and depression who was referred to sleep medicine for evaluation of worsening daytime fatigue and fragmented sleep. She reported daytime sleepiness, morning headaches, and gasping arousals. Her Epworth sleepiness scale score was markedly elevated at 19 (normal < 10), and she was subsequently referred for home polysomnography testing for sleep apnea. Home sleep testing revealed an apnea-hypopnea index of 12.5 events/hour and a minimum oxygen saturation of 85%.

Conclusion: This patient is at higher risk for sleep disruption due to her diagnosis of CANVAS. She presented with excessive daytime sleepiness and was found to have mild OSA on home sleep testing. Little is known about the presentation of OSA in patients with CANVAS. OSA treatment has the potential to improve sleep symptoms, quality of life, and mood disruption in

this patient with an otherwise progressive and disabling neurologic disorder. Therefore early recognition and intervention of OSA are important in the care of patients with CANVAS. Given the disease's progressive nature and lack of a cure, it is necessary to ameliorate quality of life however possible. OSA leads to persistent fatigue and may result in psychiatric disturbances, therefore, it is necessary to address sleep disturbances secondary to movement disorders to combat these outcomes.

Support (if any):

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0980

A CHILD WITH ACHONDROPLASIA, CERVICOMEDULLARY JUNCTION COMPRESSION, SEVERE OBSTRUCTIVE SLEEP APNEA AND PULMONARY HYPERTENSION

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Introduction: Achondroplasia is a short stature autosomal dominant skeletal dysplasia. Children with Achondroplasia are at risk for multiple medical comorbidities including sleep disordered breathing due to midface hypoplasia and craniocervical junction compression. Recent guidelines from American Academy of Pediatrics on health supervision of children with achondroplasia recommend routine clinical screening for symptoms of obstructive sleep apnea (OSA) and craniocervical junction compression in which case a polysomnogram should be considered.

Report of case(s): The patient is a now 15 month old male who was initially seen in sleep medicine clinic at age 4 months for snoring and respiratory distress while awake. Polysomnogram 2 days later demonstrated severe OSA. The study demonstrated an oAHI of 25.1/hour, O2 nadir of 77%, and TcCO₂ with evidence of significant hypoventilation with TcCO₂ max of 67mmHg. This was adequately treated with supplemental oxygen. The patient subsequently presented to the emergency department at age 7 months with hypoxemic respiratory failure and signs of right heart failure and was started on CPAP. Echocardiogram demonstrated significant pulmonary hypertension. Subsequent CPAP titration study during admission demonstrated adequate treatment of OSA and his pulmonary hypertension significantly improved with the patient requiring no pulmonary hypertension treatment at discharge. At age 9 months, the patient was again admitted with hypoxemic respiratory failure and subsequent brain MRI demonstrated foramen magnum stenosis requiring subsequent surgical decompression. He was discharged on CPAP, however, was not tolerating this at home. Therefore, repeat polysomnogram was obtained that demonstrated severe OSA that was not responsive to supplemental oxygen. The patient was then started on BPAP therapy which he has since been tolerating well.

Conclusion: Children with achondroplasia are at increased risk for sleep disordered breathing and craniocervical junction compression. Our patient experienced significant complications from OSA at a young age. His sleep apnea worsened significantly in a short period making it unresponsive to previous treatment recommendations. There is a need for further studies to determine better screening guidelines for craniocervical junction narrowing and OSA. This case highlights the dynamic nature of sleep disordered breathing in achondroplasia and need for close follow up and monitoring of symptoms at all clinical encounters.

Support (if any):

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0981**COMPLEX SLEEP APNEA IN A PATIENT WITH ROHHAD**Ellen Ariail¹, Daniel Hsu¹¹ Baylor College of Medicine

Introduction: Rapid onset obesity with hypothalamic dysregulation, hypoventilation, and autonomic dysregulation (ROHHAD) is a rare disorder associated with sleep disordered breathing. Patients often have obstructive sleep apnea (OSA) and nocturnal hypoventilation (NH). We present a case with a unique sleep disordered breathing pattern demonstrating both severe central and obstructive sleep apnea demonstrated on two separate polysomnograms with no evidence of significant NH.

Report of case(s): The patient is a now 8 year old girl who was initially diagnosed with ROHHAD in October 2020 at age 5 years with symptoms of rapid weight gain, hypothalamic dysfunction (hyperprolactinemia), and autonomic dysfunction (recurrent fever, and hypertension). Diagnostic polysomnography in May 2020 demonstrated severe OSA (oAHI 23.4/hr) as well as central sleep apnea (CAI 63.9/hr). The SaO₂ nadir was 88% with 15 minutes spent below 90%. There was no evidence of NH, however the CO₂ was greater than 50 mmHg for 9.5% of total sleep time. Subsequent titration study recommended BPAP ST of 14/10 cmH₂O with back up rate (BUR) of 12 bpm. The patient had a repeat split night study in May of 2022 at age 7 years. During the diagnostic portion, she demonstrated persistent severe OSA (oAHI 39/hr) and central sleep apnea (CAI 21/hr). There was no evidence of NH with a max TCO₂ of 50 mmHg and CO₂ > 50 mmHg for 0.2% of total sleep time. BPAP ST of 18/10 cmH₂O with BUR of 12 bpm led to resolution of obstructive and central apnea events.

Conclusion: ROHHAD remains a rare disease which is often associated with sleep disordered breathing. While there have been rare reports of CSA in ROHHAD, there have been none of this severity. CSA may be a representation of autonomic dysfunction, and previous literature has described central pauses in breathing in ROHHAD patients while awake. While she did not have evidence of hypoventilation on either polysomnogram, which is one of the hallmarks of this disease, it has been described that nocturnal hypoventilation may develop later in the course of the disease. Thus, it remains important to routinely screen patients with polysomnograms as their sleep disordered breathing evolves.

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0982**ATRIAL FIBRILLATION DIAGNOSED FROM A HOME-BASED SLEEP STUDY IN A PATIENT WITH REM BEHAVIOR DISORDER**Aygun Asgarli¹, Junjie Liu¹¹ Department of Neurology, University of Iowa

Introduction: Atrial fibrillation (A-Fib) is the most common form of cardiac arrhythmia and is a major cause of stroke. Obstructive sleep apnea (OSA) is an established risk factor

of A-Fib, but sleep disruption with frequent awakenings was recently identified as another risk factor, independent from OSA. Home sleep apnea test (HSAT) is widely used to diagnose OSA with low cost and short wait time, and HSAT that uses peripheral arterial tonometry (PAT) can reveal cardiac arrhythmia. Here we report a case of A-Fib detected by PAT-based HSAT in a patient with REM sleep disorder.

Report of case(s): A 60-year-old man with hypertension, depression, anxiety, tobacco and alcohol use disorders presented to sleep clinic for frightening vivid dreams and violent dream enactments that gradually developed over the last two years. A diagnostic polysomnography study showed mild OSA, normal heart rhythm, and no epoch of REM sleep without atonia (RSPA). In the following four years, he used CPAP therapy, imagery rehearsal therapy, high-dose melatonin, doxepin and hydroxyzine. However, the frightening dreams and dream enactments persisted despite full adherence to CPAP. To reassess OSA, the patient took a PAT-based HSAT, which showed not only mild OSA, but one episode of irregularly irregular PAT-derived pulsation variations that lasted three hours and started and stopped abruptly. We therefore ordered longitudinal cardiac monitoring, which showed multiple asymptomatic episodes of A-Fib during nighttime. After treatments for A-Fib were started, a polysomnography study with effective CPAP titration showed one episode of A-Fib with rapid ventricular response that lasted 2.5 hours during non-REM sleep, and multiple epochs of RSPA. The diagnosis of REM sleep behavior disorder (RBD) was thus established.

Conclusion: We reported concurrent developments of RBD and asymptomatic paroxysmal A-Fib in a man in his early sixties. Our case suggests a potential association between RBD and A-Fib, which has not been studied but is conceivable, given that RBD causes frequent awakenings with surges of sympathetic activity. Our case also highlights the advantage of PAT in capturing not only OSA but cardiac arrhythmia. Clinical interpreters of PAT-based HSAT can seize the opportunity to diagnose A-Fib and prevent stroke.

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0983**HAND DOMINANCE IN SEXSOMNIA: A CLUE TO PATHOPHYSIOLOGY?**Varun Badami¹, Alon Avidan², Carlos Schenck³¹ David Geffen School of Medicine, University of California Los Angeles, ² UCLA, ³ University of Minnesota Medical School

Introduction: Sexsomnia is a variant of confusional arousal, a NREM parasomnia (NREMP), typically consisting of sexual behaviors manifesting upon partial arousal from deep NREM sleep; however, its pathophysiology is not well understood, and literature is limited. We present a series of patients with non-dominant hand sexsomnia behaviors that may reveal important new clues about the neurophysiologic mechanisms of sexsomnias.

Report of case(s): Case 1: 22 y/o right-handed (RH) female, no history of NREMP, or snoring. Presenting complaint (PC): 8-year history of sleep masturbatory behavior (MB) including partial awakening from MB with bloody fingers (left hand) during her menstrual period in the setting of delayed sleep phase disorder. Case 2: 30 y/o ambidextrous male with a history of NREMP. PC: MB involving the left hand, observed by bed

partner (BP) in the setting of weight gain and apneas. PSG: AHI 17/h and PLMI 23/h. Case 3: 33 y/o RH female with a history of NREMP. PC: left-handed sleep MB observed by BP in the setting of multiple sclerosis with C2-3 and C4 right posterolateral demyelinating lesions on C-spine MRI. Case 4: A 44 y/o RH male with OCD, depression, and no history of NREMP. PC: bilateral MB and dream enactment behaviors observed by BP, in the setting of sertraline. Events resolved upon switching to quetiapine. Case 5: A 59- y/o RH female with multiple system atrophy (MSA) and RBD, no previous NREMP. PC: sleep MB, noted by BP involving the left hand in the setting of worsening dysautonomia. Dream enactment occurred bilaterally. PSG: AHI 34/h, PLMI: 70/h and REM sleep without atonia. Spells improved with melatonin and PAP.

Conclusion: This case series highlights a pattern of adult sleep MB involving the non-dominant (left) hand in 4/5 cases and the left hand in one ambidextrous patient. There was no evidence of gender predilection. We speculate that sexsomnia originates from central pattern generators in the brainstem and spinal cord, as opposed to the cerebral cortex (which would likely involve the dominant hand). The lack of involvement of cerebral motor control is further substantiated by amnesia for sexsomnia events.

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0984

NEAR DROWNING: A COMPLEX CASE OF SOMNOLENCE AND WEAKNESS

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Introduction: Narcolepsy is a disorder of sleep characterized by pathologic daytime sleepiness classically divided into two major subtypes – those with or without cataplexy. The underlying pathophysiologic mechanism is thought to be related to hypocretin/orexin; pathologically low levels of hypocretin characterize narcolepsy with cataplexy. We present a complex case of weakness in a patient evaluated for narcolepsy.

Report of case(s): A 38 year-old male with a BMI of 33 presented with a decade of daytime sleepiness and sudden debilitating attacks of muscle weakness. He underwent level III home sleep testing revealing a respiratory event index of 5.3/h. After an unsuccessful trial of mandibular advancement, he was started on positive airways pressure (PAP) but continued to experience daytime sleepiness and episodes concerning for cataplexy including sensation of legs feeling stiff and falling with stress. He also described episodes of weakness while swimming with inability to stand or stabilize, prompting evaluation for narcolepsy with cataplexy. Sleep diary showed average nightly sleep of 6.5 hours, low sleep latency, and refreshing napping. He underwent PSG while using CPAP 8 cm H₂O showing AHI 0.2/h, sleep time 6.2 hours, sleep latency 5.5 minutes and REM latency 33 minutes with evidence of REM sleep without atonia. He underwent MSLT showing a mean sleep latency of 7.6 minutes and 3/5 REM sleep onset periods. Therapeutic trials of venlafaxine and pitolisant did not result in symptomatic improvement, and further genetic testing with HLA DQB-1 was negative. CSF hypocretin measurement was normal (329 pg/mL, reference > 200 pg/mL). These effectively ruled out cataplexy as the cause of his weakness. He continued on PAP therapy, venlafaxine, and modafinil 200 mg for hypersomnia/narcolepsy without cataplexy with good response.

Conclusion: We present a complex case highlighting the utility of HLA and confirmatory CSF testing in the evaluation of cataplexy with episodes of acute weakness accompanying stress and strong emotion, with particularly dangerous events during swimming. Due to lack of therapeutic response despite positive MSLT, further testing with HLA and CSF hypocretin were pursued. This case highlights the limitations of history alone in the diagnosis of cataplexy, and the utility of advanced testing.

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0985

OXYBATE INDUCED MANIA

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Introduction: Hypersomnia sleep disorders are characterized by overwhelming daytime sleepiness. Treatment options include sodium oxybate the sodium salt of γ -hydroxybutyric acid (GHB). Oxybate, an endogenous metabolite of GABA, acts through GABAB noradrenergic and dopaminergic neurons, as well as at thalamocortical neurons. < 1% may experience suicidal ideations or psychosis.

Report of case(s): A 17-year-old female with obesity, spina bifida occulta follows with sleep for idiopathic hypersomnia with long sleep (TST 12.6 hours on polysomnography) and a delayed circadian rhythm. Her typical sleep zone is 11:00PM to 10:00AM, but she can easily sleep until 2:00PM. She started sodium oxybate to minimize her sleep burden and improve daytime wakefulness. She initially developed insomnia with concern for mania and migraines with photophobia and phonophobia. After 26 days, oxybate was discontinued. Her migraines persisted daily. Her sleep schedule and mood returned to baseline within 17 days thereafter. A 48-year-old female with anxiety/depression, PTSD has follows with sleep since age 42 for unspecified hypersomnia, either narcolepsy type 1 with long sleep versus idiopathic hypersomnia. Initial polysomnography/MSLT on fluoxetine revealed AHI 1.6, with a mean sleep latency of 6.4 minutes without SOREMPs. Her typical sleep zone was 8:00PM to 9:00AM. She was started on sodium oxybate for her cataplexy and daytime sleepiness. She had remarkable improvement in her symptoms after 4 days. After 35 days on 9 grams nightly she developed anxiety, extracorporeal sensations, and paranoia. The dose was decreased to 7.5 grams nightly. By 7 months of therapy her paranoia progressed to the point where she threatened her landlord and was facing legal consequences. Sodium oxybate was discontinued. At 53-years-old she was trial on mixed-salts oxybate. After three months of therapy, she became hypomanic with severe pressured speech despite a euthymic mood. She reported going without sleep entirely for 3-4 days at a time using this oxybate. Mixed-salts oxybate was discontinued and 36 days later with in addition to quetiapine, her hypomania was nearly resolved and she was able to get 8-9 hours of restful sleep.

Conclusion: Hypomania appears to be a rare but serious side effect of oxybate in long-sleepers. Discontinuing oxybate may not be sufficient therapy.

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0986**THE KID WHO SLEPT IN DETENTION: DELAYED NARCOLEPSY TYPE II DIAGNOSIS**

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Introduction: Narcolepsy is a sparsely found disease with a prevalence of 0.02-0.07% worldwide. Most patients are diagnosed much later than symptom onset with a gap of several years to even decades. The inability to diagnose and lack of awareness of narcolepsy leads to poor quality of life for the patient and family, poor school performance, and increased medical and socioeconomic burden. Hence, we report a case of a child inflicted with these woes looking for an improved quality of life.

Report of case(s): A 12-year-old boy with past medical history of mild intermittent asthma, tonsillectomy, and adenoidectomy, initially presented to Allergy-Immunology for asthma management where it was revealed he was dealing with snoring and excessive daytime sleepiness since age 9. Patient was sent for Polysomnography (PSG) which revealed an Apnea Hypopnea Index (AHI) of 0.4 and Oxygen Nadir of 91%. Patient was referred to Pediatric ENT for evaluation, but further surgical intervention was not indicated. Patient continued to deal with excessive daytime sleepiness (Epworth Sleepiness Scale of 20/24) and multiple detention visits due to sleeping in class. Mother was distressed from daily conversations with school officials. Patient was referred to Sleep Medicine and found to have no cataplexy episodes, episodic symptoms, hypersexuality, or hyperphagia. Multiple Sleep Latency Test (MSLT) was ordered. Patient's PSG night prior to MSLT revealed an AHI of 0.8 and Oxygen Nadir of 91%. Urine Drug Screen prior to MSLT was negative. MSLT revealed 2 naps demonstrating Sleep-Onset REM Periods and average mean sleep latency of 5 minutes. Patient was started on Methylphenidate ER 10mg with increase in alertness. Further treatment modification and workup is ongoing.

Conclusion: Our patient experienced a delay in diagnosis of nearly three years. The patient dealt with multiple detention visits and the mother experienced harassment from the school. Increasing awareness in the school system and patient population is necessary to mitigate prejudice against the pediatric narcolepsy population. Furthermore, increased research into new biomarkers and technologies for Narcolepsy type symptoms will be critical to decreasing the gap in diagnosis.

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0987**ASKING THE RIGHT QUESTIONS: A CASE OF RESTLESS LEGS SYNDROME AND SPINAL MUSCULAR ATROPHY**

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Introduction: The association between iron deficiency and restless legs syndrome (RLS) is well established. However, there is limited data on the association between motor neuron

diseases such as spinal muscular atrophy (SMA) and RLS. A forty-three-year-old with Type 2 SMA presented to clinic for management of chronic respiratory failure. She had recently undergone surgery and chemotherapy for newly diagnosed anal cancer. However, she reported persistent abdominal pain, anorexia, weight loss, and rectal bleeding. She reported "muscle twitching" and bilateral lower extremity pain and tingling that was worse at night. Her husband would awaken every 2 hours to massage her legs. She assumed these symptoms had emerged as a result of an increase in motor function due to risdiplam, a survival motor neuron 2 splicing modifier drug. Further questioning led to the diagnosis of RLS. Bloodwork revealed severe iron deficiency anemia (hemoglobin of 6.0 g/dL, iron 13 mcg/dL, and ferritin 3 ng/ml). She received a blood transfusion and underwent sigmoidoscopy for evaluation of cancer recurrence given the report of bleeding. Fortunately, her cancer remained in remission. Her symptoms of RLS significantly improved after blood transfusions and iron supplementation.

Report of case(s): n/a

Conclusion: RLS is a complex sensorimotor syndrome. The diagnosis of RLS is clinical, relying on diagnostic criteria that requires lower extremity movement. The case is a reminder of the variable presentation of RLS in individuals with neuromuscular disorders, including SMA. How are symptoms of restless legs disclosed in patients with the inability to move and with potentially altered sensorium? The focus of the patient encounter could have anchored on the common and expected sequelae of SMA, chronic respiratory failure. Unfortunately, anchoring bias would have delayed the diagnosis and treatment of what could have been a potentially fatal disease – metastatic cancer. Ironically, the patient's longing for motor function repressed her ability to lament. To the patient, symptoms of frequent nighttime awakenings and limb discomfort were perceived as a desired side effect of a medication that would increase movement. This case emphasizes the importance of the patient interview and its value of uncovering subtle complaints that may broaden the differential diagnosis and guide further work-up.

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0988**VAGAL NERVE STIMULATION AND OSA**

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¹ UCLA

Introduction: We present a case of obstructive sleep apnea (OSA) worsened by implantation of a vagal nerve stimulator (VNS). A 22-year-old M with PMH of autism and refractory epilepsy s/p VNS implantation was diagnosed with moderate OSA. His parents noted that his sleep-disordered breathing worsened after VNS implantation. He was started on APAP 4-12 cm H₂O. Review of adherence data revealed an elevated residual apnea-hypopnea index (AHI) despite nightly usage. PAP titration study was obtained with improvement of AHI on 16 cm H₂O. Despite consequent use of determined pressure settings, residual AHI remained elevated. In consultation with the patient's neurologist, VNS settings were gradually down titrated. Residual AHI improved and remained low as CPAP settings were subsequently weaned.

Report of case(s): The vagus nerve is part of the parasympathetic nervous system. Afferent fibers project to cortical regions involved in seizure activity. Vagal nerve activation leads to desynchrony, thereby decreasing seizure activity.³ VNS, an adjunctive non-pharmacologic treatment of refractory epilepsy, consists of a generator with multiple adjustable settings and a lead connected to the left vagus nerve.¹ VNS activation, in conjunction with medical therapy, can lead to decreased seizures. However, VNS may cause complications such as vocal cord dysfunction, laryngeal spasm, and dyspnea.² In this case, VNS was noted to cause OSA due to increased airway obstruction, though the pathophysiologic mechanism behind this has not been clearly delineated.³

Conclusion: Based on current evidence of precipitation or worsening OSA with VNS activation, screening and diagnostic testing for OSA in patients under evaluation for VNS placement should be considered. A multidisciplinary approach between Sleep Medicine and Neurology in conjunction with patient goals can lead to a balanced optimization of both epilepsy and OSA management via adjustments of VNS settings, anti-epileptics, and CPAP.

Support (if any): 1. VNS therapy epilepsy. Epilepsy Foundation. https://www.epilepsy.com/sites/default/files/atoms/files/516VNS_VNS_FINAL.pdf. December 20, 2022. 2. Ebben MR, Sethi NK, Conte M, Pollak CP, Labar D. Vagus nerve stimulation, sleep apnea, and CPAP titration. *J ClinSleepMed*. 2008 Oct 15;4(5):471-3. PMID: 18853706. 3. Parhizgar F, Nugent K, Raj R. Obstructive sleep apnea and respiratory complications associated with vagus nerve stimulators. *J ClinSleepMed*. 2011 Aug 15;7(4):401-7. doi: 10.5664/JCSM.1204. PMID: 21897779.

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0989

HELLO FROM THE OTHER SIDE: A GRANDMOTHER'S ETERNAL LOVE

Victor Chun¹, Alon Avidan¹

¹ UCLA

Introduction: Sleep-related hallucinations (SRH) may arise at sleep onset or on awakening from sleep and represent sleep-state dissociation with the abnormal intrusion or persistence of dreams into wakefulness. These multisensory experiences are usually visual but may be tactile and colored by emotions such as grief. We describe a patient who presented with episodes of visual and tactile hallucinations of being comforted by his late grandmother at sleep onset shortly after her death.

Report of case(s): A 20-y/o male with a history of autism spectrum disorder (ASD) presented with sleep onset insomnia related to disturbing multisensory hallucination temporally associated with the passing of his grandmother two years earlier. He sleeps for 5 hours nightly and experiences more frequent spells when sleep-deprived. The spells manifest within an hour of sleep onset and consist of the patient experiencing quasi-visual and tactile sensations of his grandmother wrapping her hands through his hair and hugging him. The episodes are associated with longing and sadness as this was customary for his grandmother as she comforted him to sleep when she was alive. The patient's interpretation was that the episodes might represent his grandmother's attempt to communicate with him and keep him safe. Polysomnography depicted REM sleep latency of 107 minutes without evidence of REM sleep without atonia. There was no evidence of obstructive sleep apnea.

Conclusion: Sensory and quasi-sensory experiences of the deceased (SED) is an inclusive and neutral term used to describe multisensory experiences of the presence of the deceased. Phenomenologically, post-bereavement hallucinations are more closely aligned with the ICD-3 classification of SRH. The patient's spells of SED were likely facilitated by sleep deprivation. Emerging data also supports the presence of unusual somatosensory experiences leading to supernatural attribution to these experiences in ASD. With the passing of his grandmother, the combination of grief and sleep deprivation along with altered central sensory processing likely contributed to the SED. SED and SRH represent a spectrum of abnormal hallucinations following bereavement and are facilitated by sleep deprivation. In ASD, the episodes might emerge in response to altered central limbic sensory processing and represent an important mechanism of impaired REM sleep in Autism spectrum.

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0990

OBSTRUCTIVE SLEEP APNEA IN PATIENT WITH WHITE-SUTTON SYNDROME PRESENTING WITH SECONDARY POLYCYTHEMIA

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Introduction: White-Sutton syndrome is a rare autosomal dominant genetic disorder associated with POGZ de novo genetic variants. Patients with White-Sutton syndrome experience a wide spectrum of disease most common being neurocognitive delays, however various sleep disturbances have also been reported. The incidence of obstructive sleep apnea in patients with White-Sutton syndrome has been previously only defined in cohort studies utilizing subjective screening questionnaires.

Report of case(s): We present a case of a 14-year-old male with past medical history of White-Sutton Syndrome who was referred to the sleep clinic by Pediatric Hematology-Oncology for an evaluation of sleep disordered breathing as part of a secondary polycythemia work-up. Patient's height was 173.6 cm, weight was 111.8 kg, and BMI was 37.1. Patient's prior laboratory work-up was remarkable for polycythemia with hematocrit of 50.5% and hemoglobin of 16.8 g/dL. He also had a reassuring bicarbonate level of 22 and no documented daytime oxygen desaturations. The PSG was scored using adult criteria due to the patient's height and weight. He was diagnosed with moderate obstructive sleep apnea with an apnea-hypopnea index (AHI) of 15.5 per hour and a nadir oxygenation saturation of 89%.

Conclusion: To the author's knowledge, this is the first case report of a pediatric patient with White-Sutton syndrome with diagnosed obstructive sleep apnea via polysomnography. This is also the first case report of a pediatric patient undergoing polycythemia work-up who was subsequently diagnosed with obstructive sleep apnea.

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0991

DUAL THERAPY TO TREAT CIRCADIAN RHYTHM DISTURBANCE IN UNIQUE GENETIC MUTATION OF SMITH-MAGENIS SYNDROMEVictoria Coccozza¹, David Kim², Benjamin Long³, Shana Hansen⁴¹ San Antonio Military Medical Center, ² 35th Air Defense Artillery Brigade Headquarters, ³ USUHS SOM Department of Pediatrics, ⁴ Sleep Disorders Center

Introduction: Smith-Magenis syndrome (SMS) is a rare disorder associated with several genetic mutations. Patients with SMS experience circadian rhythm sleep-wake disorders, which may lead to significant behavioral concerns. A proposed etiology of sleep disturbances is diurnal melatonin secretion. Treatment approaches aim at blocking the abnormal morning secretion of melatonin and providing exogenous melatonin in the evening.

Report of case(s): We present a patient with SMS having persistent sleep-wake disturbance despite dual therapy with beta-1 adrenergic antagonist in the morning and over-the-counter melatonin at night. Our patient switched to therapy with beta-1 adrenergic antagonist in the mornings and melatonin receptor agonist, tasimelteon, at night with significant improvement. In addition, our patient has mutations in JAKMIP1 and ZBTB18 genes. ZBTB18 mutation is a novel mutation in the setting of clinical features of SMS.

Conclusion: To the authors' knowledge, this is the first case report of successful combination therapy to optimize treatment of sleep-wake disturbances in patients with SMS.

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0992

REVERSIBLE PEDIATRIC CENTRAL SLEEP APNEA IN HYPERHOMOCYSTEINEMIA AND CEREBRAL SINUS VENOUS THROMBOSISKevin Coughlin¹, Anand Saha¹, Natalie Francis¹, Crystal Stanton², Ahsan Bashir¹¹ University of Tennessee Health Science Center, ² Mid South Pulmonary & Sleep Specialists PC

Introduction: Pediatric central sleep apnea (CSA) rarely initially presents in adolescent age groups, being more commonly diagnosed in infants. CSA may result from a multitude of neurological insults, such as stroke and brain masses. It may also less often present in metabolic and non-ischemic thrombotic disorders.

Report of case(s): A 12-year-old female with history of global developmental delay of unclear etiology, chronic headaches, insulin resistance, and early morning tremors was referred for initial evaluation of possible narcolepsy. Severe daytime sleepiness had acutely worsened over the previous month. She was unable to stay awake during school, despite sleeping 13 hours per 24 hours. Central hypersomnia was suspected and polysomnogram with MSLT was scheduled. The patient presented to the Emergency Department 10 days later for worsening headaches and new oral aversion with 12-pound weight loss. Examination showed ataxic gait and dysarthria. Brain MRI revealed non-occlusive cerebral sinus venous thrombosis (CSVT) involving the superior sagittal sinus, right transverse sinus, right sigmoid sinus, right jugular bulb/vein, and cortical veins overlying both cerebral hemispheres with no stroke. Anticoagulation with enoxaparin was initiated

and thrombophilia work-up commenced. Polysomnogram demonstrated a central AHI of 49.9/hr with significant periodic breathing and no obstructive sleep apnea. Oxygen titration sleep study failed to significantly improve CSA and BPAP was initiated. Thrombophilia work-up revealed severe hyperhomocysteinemia. Genetic analysis was consistent with autosomal recessive severe methylenetetrahydrofolate reductase (MTHFR) deficiency. The patient was begun on metabolic treatment with betaine, pyridoxine, hydroxocobalamin, and vitamin C, and transitioned to oral rivaroxaban. At 4 months, blood levels had normalized, and MRI demonstrated resolution of CSVT. Family endorsed BPAP compliance and complete resolution of all sleep symptoms. In addition, there was significant improvement in cognition, interpersonal skills, and abstract thought. Follow up polysomnogram 10 months after presentation demonstrated no CSA nor periodic breathing.

Conclusion: To our knowledge, this is the first report of MTHFR deficiency and CSVT resulting in severe CSA. While it is difficult to ascertain which entity ultimately caused the CSA, MTHFR deficiency can produce significant neurologic impairment through white matter disease and defective myelination, while CSVT can provoke venous hypertension, venous stasis, or hypoxia.

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0993

A SENSELESS SENSING LEAD: A CASE OF FAILED SENSING LEAD IN HYPOGLOSSAL NERVE STIMULATORAndrea Fekete¹, Aarti Grover¹, Wei He¹, Joel Oster¹, Peter Ostrow¹, Greg Schumaker¹, Richard Wein¹, Rajesh Zacharias¹¹ Tufts Medical Center

Introduction: The hypoglossal nerve stimulator (HGNS) is an implanted device used to treat moderate to severe obstructive sleep apnea (OSA), offering an alternative form of therapy to continuous positive airway pressure. Currently, the Inspire® Upper Airway Stimulation (UAS) system is the only such device approved by the U.S. Food and Drug Administration (FDA).

Report of case(s): We present a case of sensory lead malfunction in a 54-year-old man with moderate OSA who underwent HGNS implant in 2018 with the three-incision method and the sensory lead positioned in the 6th intercostal space. December 2022, the patient presented with right sided chest pain and subjective fever at outside hospital. A CT chest performed was significant for trace right sided pleural effusion and concern for pleural penetration of the sensory lead. Device interrogation in our office showed increased impedances and abnormal waveforms prompting discontinuation of therapy and scheduling a surgical revision. He denied any trauma, injury to the area and had been doing well overall but did feel as if the device wasn't syncing appropriately with his breathing. In addition, his most recent sleep study on fairly high amplitude of 3.6V had persistent severe supine disease. During the surgery, the sensory lead was noted to be in its original placement site with intact anchors and sutures holding it in place. After the lead was removed there was noted to be a discoloration deep to the protective covering suggesting potential lead failure related to compromise of device.

Conclusion: Since its FDA approval in 2014, over 20,000 HGNS devices have been implanted in the USA and long-term data collection of efficacy and safety is ongoing. The Manufacturer and

User Facility Device Experience (MAUDE) is a publicly available database of device-related adverse events reported to the FDA. At the time of this abstract, there are 714 reports related to HGNS of which 147 involve the respiratory sensory lead and 95 of these relate to pain and/or malfunction most commonly due to sensor tip separation and migration from lead body. This case illustrated a presentation of sensory lead malfunction due to presumed electrical leakage from insulation breach.

Support (if any):

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0994

NEUROBLASTOMA AS THE INITIAL MANIFESTATION OF FAMILIAL PHOX2B NPARM POSITIVE CONGENITAL CENTRAL HYPOVENTILATION SYNDROME

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Introduction: Congenital Central Hypoventilation Syndrome (CCHS) is a genetic disorder of the autonomic nervous system caused by mutations in the PHOX2B gene. Children with CCHS often present as neonates in hypoxemic, hypercarbic respiratory failure. Most causative mutations are de novo Polyalanine Repeat Mutations (PARMs). Non-Polyalanine Repeat Mutations (NPARMs) have been associated with more severe disease, specifically the need for 24-hour ventilatory support, Hirschsprung disease, and neural crest tumors; however, NPARMs may have variable expressivity and incomplete penetrance, resulting in delayed or atypical presentations. We report a toddler with maxillary sinus neuroblastoma, which led to the diagnosis of familial PHOX2B NPARM positive CCHS.

Report of case(s): A two-year-old boy presented with right-sided facial swelling. A facial CT uncovered a right maxillary sinus lytic lesion, and biopsy confirmed neuroblastoma. After full recovery from the procedure, he had persistent nocturnal hypoxemia and hypercapnia requiring bilevel positive airway pressure (PAP) during sleep, raising concern for CCHS. Genetic testing revealed a novel PHOX2B NPARM, c.428dup, which likely causes a frameshift and premature protein termination (p.Val144Glyfs*34). His maternal grandfather, mother and brothers tested positive for the same mutation. Family history revealed that his maternal grandfather and maternal great-uncles had frequent childhood apneic spells associated with syncope, his maternal grandfather is currently on nocturnal bilevel PAP, and his mother almost drowned as a younger child while having a breath-holding contest under water. His six-year-old brother underwent polysomnography which showed hypoventilation, now managed with bilevel PAP. His five-year-old brother also underwent polysomnography and does not require nocturnal ventilatory support at this time.

Conclusion: We report a rare case of familial PHOX2B NPARM positive CCHS which initially presented as maxillary sinus neuroblastoma. Additionally, the child and his family display varying disease severity despite having the same NPARM, highlighting the variable expressivity in this novel NPARM.

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0995

SLEEP-RELATED HYPOVENTILATION IN A 62-YEAR-OLD FEMALE WITH A RARE GENETIC NEUROMUSCULAR DISORDER

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Introduction: Central Core Myopathy (CCM) is a rare genetic neuromuscular disorder involving a mutation in the 'Ryanodine Receptor' (RyR1) gene, also known as the gatekeeper of calcium within the muscle cells. CCM typically manifests as slowly progressive proximal muscle weakness. Currently, there is limited data regarding the management of nocturnal hypoventilation in adults with neuromuscular disorders.

Report of case(s): We present a 62-year-old woman with CCM, as identified via RyR1 mutation (c14818G>A) on genetic testing, as well as muscle biopsy. This genotype is associated with < 10% respiratory muscle involvement. She presented to the sleep clinic with complaints of morning headaches, non-restorative sleep, and daytime sleepiness. Her polysomnogram (PSG) showed an overall Apnea-Hypopnea-Index in the normal range. However, there was a progressive increase in transcutaneous carbon dioxide levels (PtcCO₂), reaching a peak of 53 mmHg during rapid eye movement (REM) sleep from 38 mmHg during wakefulness, consistent with sleep-related neuromuscular hypoventilation. On further evaluation, this patient had no evidence of neuromuscular restrictive lung physiology or overt diaphragmatic dysfunction, as suggested by < 20% variation in the supine forced vital capacity. Moreover, her negative inspiratory force (NIF) value was not less than negative 40. However, in the setting of her sleep-related symptoms and evidence of nocturnal hypoventilation, our team decided to trial non-invasive positive pressure ventilation (NIPPV). Since we had concerns about respiratory alkalosis in NREM sleep in the setting of normal body mass index, normal pulmonary function tests, and hypoventilation limited to REM sleep, the patient was sent for in-lab titration of pressures with measurement of PtcCO₂ to appropriately recommend NIPPV settings. The study demonstrated bi-level positive airway pressure settings of IPAP 7 cmH₂O, EPAP 5 cmH₂O, and a backup rate of 12/min resulting in sustained eucardia and steady PtcCO₂ levels during both REM and NREM sleep.

Conclusion: This case highlights the importance of evaluation for nocturnal hypoventilation in symptomatic patients with rare neuromuscular disorders and the potential for symptomatic improvement with treatment with NIPPV. Moreover, the case demonstrates the importance of in-lab titration of pressure settings for NIPPV when hypoventilation is limited to REM sleep, due to concern for iatrogenic hyperventilation and respiratory alkalosis.

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0996**A NEW INSOMNIA PHENOTYPE: CORONASOMNIA MISOPHONIA SYNDROME**Narayana Gowda¹, Alon Avidan¹¹ UCLA

Introduction: Misophonia is a complex neuropsychiatric phenomenon characterized by an intense selective auditory hypersensitivity to auditory stimuli accompanied by emotional intolerance consisting of anger, anxiety, and frustration. We report on four subjects who presented with significant sleep onset insomnia coinciding with the mandated stay-at-home order in March 2020. All patients reported unique and specific irritability and aversion to sounds in their proximal environment - the misophonic trigger (MT). While a previous study reported on the capacity of misophonia to emerge during venerable periods of confinement, we report a series of four patients in whom misophonia was a unique precipitant of insomnia, a “misophonic response” accompanied by hypervigilance and insomnia. Our findings support the consideration of a unique insomnia phenotype - Coronasomnia Misophonia Syndrome (CMS).

Report of case(s): Subject A is a 29-year-old female with a history of OCD and mild insomnia (MT: humming refrigerator). Subject B is a 31-year-old female with a history of delayed sleep phase disorder in her teenage years (MT: husband's breathing). Subject C is a 36-year-old male with well-controlled sleep-onset insomnia (MT: electric humming from walls). Subject D is a 46-year-old male with well-controlled depression (MT: carotid pulsation transmitted through his pillow). All but one patient had reasonable improvement with mindfulness therapy combined with systematic desensitization. Subject A improved after pharmacological modification of OCD therapy.

Conclusion: Our case series supports CMS as a unique insomnia phenotype coinciding with social isolation during the COVID-19 pandemic. The MT might have served as a precipitant through classical conditioning. Desensitization with mindfulness therapy was helpful, but the presence of comorbid OCD led to a refractory course supporting pervasive sensory processing in this patient. Our data highlights the need for more dedicated investigation for MT in patients presenting with insomnia during times of confinement and unprecedented anxiety. Additional data is needed to support our observation and investigate the potential psychophysiological mechanism, particularly the proposed alteration in auditory processing in response to the MT in healthy and psychiatric cohorts.

Support (if any):

Abstract citation ID: zsad077.0996

0997**SEVERE MIXED SLEEP APNEA IN A PATIENT WITH EPILEPSY AND GENE MUTATION EEFIA2**Divya Gupta¹, Anjalee Galion²¹ University of California, Irvine, ² Children's Hospital Orange County

Introduction: EEFIA2 gene mutation has been linked with epilepsy and intellectual disability. There have been case series and case reports in the past that have linked the gene mutation with both epilepsy and possible phenotypes of broad nasal bridge and tented upper lip. In previous cases, there has been no description

of work up of sleep disordered breathing. Here, we present a case of sleep apnea in a patient with intractable epilepsy and gene mutation.

Report of case(s): Patient is a toddler-aged female with epilepsy. She was diagnosed with infantile epileptic encephalopathy with a pathogenic mutation in EEF1A2 gene with intractable generalized myoclonic epilepsy, hypotonia, and developmental delay. She has been on several seizure medications in an effort to obtain seizure control. With medications she has been undergoing side effects of swallowing difficulties and increased sedation. During her neurology epilepsy follow up, she was noted to have frequent nighttime awakenings. She was scheduled to have a combined polysomnography and 24-hour electroencephalogram. Polysomnography performed which showed evidence of severe mixed central and obstructive sleep apnea-hypopnea syndrome with AHI of 100/h, CAI 42/H, OAH1 - 57/h, and REM AHI of 106/h. Video Electroencephalogram performed at the same time and showed multiple atonic and myoclonic seizures with multifocal discharges. Patient was evaluated by otolaryngology and was not a candidate for surgical interventions. She was titrated on bilevel positive airway pressure during a split titration sleep study.

Conclusion: Genetic mutations and their phenotypes are becoming more widely addressed and researched. In this case we present a rare genetic mutation EEFIA2 which has presented as intellectual disability, hypotonia, and intractable epilepsy in this patient. Given some daytime somnolence and nighttime awakenings, a polysomnography was pursued and showed severe obstructive sleep apnea. In cases where phenotypes are not widely known, it is important to screen for sleep disorders.

Support (if any):

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0998**DULOXETINE AS A POSSIBLE EFFECTIVE TREATMENT OF KLEIN-LEVIN SYNDROME CASE REPORT**Samuel Hall¹, Sally Ibrahim²¹ Case Western Reserve University, ² University Hospitals Cleveland Medical Center

Introduction: Kleine Levin Syndrome (KLS), or recurrent hypersomnia, is a rare sleep disorder characterized by recurrent episodes of severe hyper-somnolence lasting several days to several weeks. Because the etiology is unknown, treatment is mostly supportive. Some pharmacologic agents have been attempted to treat symptoms during episodes with limited success.

Report of case(s): Patient is a 17 year-old with a history attention-deficit hyperactivity disorder and generalized anxiety disorder who presented to the clinic due to recurrent episodes of severe hypersomnolence associated with derealization and cognitive dysfunction during all episodes, anxiety of being alone, and other symptoms in some episodes such as altered taste affecting appetite, and binge eating. The patient was diagnosed with KLS and tracked episodes which lasted 11-12 days (average) with recurrence every 10-17 days. Labs, 72 hour EEG, MRI and MRA were largely unremarkable. The family declined trial of Lithium. Pharmacogenetic testing showed significant gene-drug interaction with duloxetine requiring higher drug dosage for effects. After psychiatry started duloxetine, the patient experienced a 7 month period without episodes. Then episodes recurred for unclear reason while on duloxetine

but with slightly less duration (6-12 days) and shorter time between episodes. Duloxetine was discontinued due to lack of mood effects. Clarithromycin was trialed next for use during episodes without changes. Episodes were tracked for several months with some predictability. Duloxetine was restarted a second time after several months, and the patient showed mild improvement in event duration down to 8-11 days for a few months. Time between episodes also shortened to 8-10 days. Anxiety was only slightly reduced between and during the episodes, though they still continued to struggle with derealization and ability to focus during episodes that effected school and work functioning. Interestingly, they also started to have more insomnia between episodes while on duloxetine.

Conclusion: KLS is a rare disorder with limited data on effective treatments. To date, this is the first report of a prolonged brief KLS remission with duloxetine. Norepinephrine and serotonin modulation may limit episode duration. More research is needed to determine whether duloxetine can modulate the effects of KLS.

Support (if any): None

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0999

A DRAMATIC RESPONSE TO SLEEVE GASTRECTOMY IN A PATIENT WITH SEVERE OBSTRUCTIVE SLEEP APNEA

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Introduction: Obesity is a well-established major, yet modifiable risk factor for the development of obstructive sleep apnea (OSA). Weight loss has consistently been associated with improvement in OSA severity. Here, we present a case of a patient with morbid obesity and severe OSA who underwent bariatric surgery, which resulted in complete resolution of sleep apnea.

Report of case(s): A 31-year-old woman with a history of morbid obesity (body mass index (BMI) 54kg/m²) and diabetes mellitus was seen in the sleep disorders clinic with symptoms of loud snoring, gasp awakenings, fragmented sleep, and excessive daytime sleepiness with an Epworth sleepiness score (ESS) of 18. Polysomnography (PSG) demonstrated severe OSA with an apnea-hypopnea index (AHI) of 129/hr, mean arterial oxygen saturation (SaO₂) of 85%, and nadir SaO₂ of 52%. Continuous positive airway pressure (CPAP) was prescribed but never started. One year later, she returned requesting treatment for OSA as part of evaluation for bariatric surgery. A split-night PSG re-demonstrated severe OSA with AHI 60/hr and nadir SaO₂ of 51% with 54% of total sleep time spent with SaO₂ less than 88%, and a good response to CPAP 14cmH₂O with residual AHI 4/hr. CPAP was started and she demonstrated excellent adherence on follow up. Three years lapsed before she returned to the sleep clinic. During this time, she had undergone a sleeve gastrectomy and was successful at losing 156lbs (achieving BMI 31kg/m²). She reported resolution of snoring and daytime sleepiness with ESS of 1. She stopped using CPAP six months after surgery and wished to be re-evaluated for OSA. Repeat PSG showed no evidence of OSA with AHI 1/hr and SaO₂ nadir of 91%.

Conclusion: Bariatric surgery is considered the most effective treatment for obesity and is indicated for patients with BMI 35kg/m² or greater with comorbid OSA. Although observational and randomized studies of weight reduction surgery have shown improvement in OSA severity post-operatively and even cure in some cases, few patients exhibit the extreme reduction in AHI seen here, with complete resolution of OSA. This case serves as an important reminder that weight loss should be a priority when managing patients with OSA and excess body weight.

Support (if any):

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1000

HYPNAGOGIC HALLUCINATIONS AS A MANIFESTATION OF PARKINSON'S DISEASE

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Introduction: Narcolepsy and Parkinson's disease (PD) share many similar symptoms. Narcolepsy is characterized by excessive daytime sleepiness, sleep attacks, sleep paralysis, and hallucinations, with or without cataplexy. Hypnagogic hallucinations occur while falling asleep and the person experiencing them typically knows they are not real. Here, we present a case of hypnagogic hallucinations as a manifestation of PD in a patient without narcolepsy.

Report of case(s): A 66-year-old female with a history of tremor was seen in the sleep disorders clinic with chief complaints of dream enactment and excessive daytime sleepiness. She described bruising after falling out of bed. On further questioning, she reported instances of seeing "death and a grim reaper as well as a dark figure", usually upon falling asleep at night. She denied daytime hallucinations. She underwent diagnostic polysomnography (PSG), which showed mild obstructive sleep apnea and loss of rapid eye movement (REM) atonia during brief periods of REM sleep. Treatment for dream enactment was implemented by increasing her dose of melatonin (which she had been taking for insomnia) and initiation of clonazepam, which led to significant improvement in dream enactment. Over the next two years, she was diagnosed with PD and started on carbidopa-levodopa. She reported more frequent hypnagogic hallucinations during a follow-up visit, occurring 1-2 times weekly, which her neurologist attributed to being on higher dosages of dopaminergic therapy. During a recent visit, she reported no dream enactment and infrequent hypnagogic hallucinations.

Conclusion: Sleep disturbances in PD are common and include insomnia, hypersomnia, and REM behavioral disorder (RBD). A lesser appreciated association is that between hypnagogic hallucinations and PD, as depicted in this case. Partial hypocretin cell loss in PD has been postulated to result in disturbed hypocretin signaling, which probably explains the occurrence of narcolepsy-like symptoms (including hypnagogic hallucinations) in PD. Hypnagogic hallucinations are more common among patients with PD compared to the general population and tend to occur more as PD progresses, with longer duration of treatment with dopaminergic agents, with older age, and in patients with RBD. This case serves as an important reminder that hypnagogic hallucinations are not

pathognomonic for narcolepsy and are likely underappreciated in PD.

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1001

A CASE OF UNUSUAL NOCTURNAL MOVEMENTS CONSISTENT WITH PAROXYSMAL HYPNOGENIC DYSKINESIA

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Introduction: Paroxysmal hypnogenic dyskinesia (PHD) is a rare subset of paroxysmal dyskinesias characterized by recurring involuntary dystonic or choreoathetoid movements that occur during sleep or immediately after an arousal from sleep. These episodes often occur without loss of consciousness or trigger and lack association with epileptiform electroencephalography (EEG) activity.

Report of case(s): A 61-year-old male with obstructive sleep apnea compliant with PAP was referred for abnormal nighttime movements for the past 9 years. The episodes were characterized by stereotyped involuntary dystonic posturing involving his upper extremities or his entire body lasting up to 15 seconds. The onset of the events occurred invariable during nighttime sleep and resulted in awakenings from sleep. He denied dream enactment as well as other symptoms suggestive of sleep-related movement disorders or parasomnias. Sleep deprived EEG demonstrated left temporal slowing during wakefulness and drowsiness and captured a typical event that occurred during NREM stage II sleep and had no ictal correlate. An MRI of the brain was unremarkable. During overnight polysomnogram, his current PAP settings were found to be effective, and three episodes of body stiffening consistent with his typical events were captured. These episodes were found to occur after awakening from REM sleep and lasted less than 10 seconds each. There was no EEG correlate, and REM atonia was preserved throughout. The patient was started on oxcarbazepine for the nocturnal movements, which reduced the frequency of events from 12 to 4 events per night. Oxcarbazepine was tapered and discontinued due to side effects and incomplete control of the events. Genetic testing for epilepsy syndromes is pending.

Conclusion: PHD is a rare syndrome of involuntary movements which begin during sleep or cause awakenings from sleep and can be misdiagnosed as a sleep disorder. It is crucial for the sleep physician to be aware of possible neurological causes of sleep-related movement disorders. Furthermore, our patient's partial response to oxcarbazepine may further support that PHD may have an epileptic origin although not well characterized.

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1002

BILATERAL NONARTERITIC ANTERIOR ISCHEMIC OPTIC NEUROPATHY (NAION) IN A PATIENT WITH OBSTRUCTIVE SLEEP APNEA (OSA)

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Introduction: Nonarteritic Anterior Ischemic Optic Neuropathy (NAION) is an ischemic insult to the anterior portion of the optic nerve with unclear etiology. Several small sized studies and case reports have demonstrated association between OSA and NAION. In this case, we present a patient with bilateral NAION who was later diagnosed with OSA which may signify this important clinical association.

Report of case(s): A 57-year-old man with history of hypertension, presented to the ophthalmology clinic for sudden painless decreased visual acuity of the right eye for one-month duration. He had no history of head trauma or other neurological deficits on his initial presentation. He reported having "bad vision" in his left eye for the entire of his life. Funduscopy evaluation revealed bilateral optic disc edema more in the left eye. Laboratory workup including CBC, CMP and HbA1C were within normal limits. Brain MRI showed only mild nonspecific scattered subcortical and deep periventricular hyperintensities suggestive of chronic small vessel ischemic disease and no acute infarct or masses. MRI of the orbits was normal. A diagnosis of bilateral Nonarteritic Anterior Ischemic Optic Neuropathy (NAION) was highly suggested based on the clinical history and examination findings. A referral to a sleep clinic was made to evaluate for possible sleep apnea. A polysomnogram confirmed obstructive sleep apnea with AHI of 7.2/h, REM AHI of 7.7/h and supine AHI 14.9/h. Nocturnal hypoxemia associated with the respiratory events with time of O₂ saturation < 88% for 29 minutes. Patient was referred for a titration study to determine the appropriate PAP pressure to treat his sleep disordered breathing.

Conclusion: This case adds to the current evolving evidence of the link between OSA with NAION. It signifies the importance of having an index of suspicion, among both sleep specialists and ophthalmologists, to recognize patients who may have one of the conditions and consider screening for the other, which may lead to earlier diagnosis and improved outcomes.

Support (if any):

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1003

IMMEDIATE IMPROVEMENT OF SECOND DEGREE HEART BLOCK WITH EFFECTIVE TREATMENT OF SLEEP-DISORDERED BREATHING

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Introduction: Cardiac arrhythmia and heart block in particular is commonly found in association with obstructive sleep apnea (OSA). Here we describe real-time responsivity of 2nd degree heart block to treatment of OSA with positive airway pressure (PAP) during a titration study.

Report of case(s): Our patient is a 70-year old man without significant cardiovascular disease. He presented with loud snoring and excessive daytime sleepiness. A home sleep

apnea test in July 2020 revealed obstructive sleep apnea (respiratory event index 20, oxygen saturation nadir 86%). The patient was treated with auto-adjusting continuous positive airway pressure (APAP) and had symptomatic benefit. His most recent machine data download suggested an elevated residual respiratory event index (REI) of 19.6, 16.5 of which were central. A split-night study was performed to re-characterize the nature of the patient's obstructive sleep apnea and treatment needs. The baseline portion of the study (AHI 50.8, oxygen saturation nadir 86%) was notable for the presence of frequent 2nd degree heart block (171.0 events/hour of recording). During the titration portion of the study, frequent central sleep apneas emerged with the addition of PAP therapy, consistent with treatment-emergent central sleep apnea. The patient was transitioned to bilevel positive airway pressure spontaneous timed mode (BPAP ST), and a pressure setting of 13/6 cm of water with backup rate of 14 breaths per minute effectively controlled his sleep-disordered breathing. The heart block that had been observed during the baseline portion of the study dramatically improved with the start of BPAP ST. Once the patient's sleep-disordered breathing was controlled, the patient's heart block occurred at a rate of only 12.1 events/hour of recording.

Conclusion: Treatment of sleep apnea has been established to be beneficial for the improvement of cardiac arrhythmias. This case is remarkably instructive in that attainment of an effective treatment setting for sleep-disordered breathing resulted in an almost immediate improvement of heart block.

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1004

A NOVEL USE OF ADAPTIVE SERVO VENTILATION FOR VNS-INDUCED CENTRAL SLEEP APNEA IN AN ADOLESCENT WITH REFRACTORY EPILEPSY

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Introduction: Epilepsy is frequently encountered in the pediatric population and some patients are treated by stimulation of the vagus nerve to reduce their seizure frequency. Vagus nerve stimulation (VNS) may induce central sleep apnea. Adaptive servo ventilation is a known treatment option for central sleep apnea in certain adult patients with heart failure and Cheyne-Stokes respiration but is infrequently utilized in the pediatric population.

Report of case(s): A 17-year-old male with a history of intractable generalized epilepsy, VNS placement, obstructive sleep apnea (OSA) and central sleep apnea (CSA) presented to our tertiary care center for management of his sleep disordered breathing. Initial management of sleep disordered breathing included CPAP for OSA. After VNS placement, the patient began to have a high residual apnea-hypopnea index on data card download of his CPAP. Polysomnography (PSG) was performed on CPAP and CSA events were noted that correlated with VNS firing. BiPAP was titrated and was unsuccessful in treating the CSA. VNS adjustment did not impact the sleep disordered breathing. Repeat titration with adaptive

servo ventilation successfully treated the OSA and CSA. In follow up, the patient is tolerating ASV with improvement in his nocturnal sleep disordered breathing events and his daytime functioning.

Conclusion: Central sleep apnea can be induced by vagus nerve stimulation. This unique case documents successful treatment of vagus nerve stimulation induced central sleep apnea by adaptive servo ventilation in an adolescent patient.

Support (if any):

Abstract citation ID: zsad077.1004

1005

THE HUNT FOR SOLUTIONS TO DAYTIME SLEEPINESS IN THE SETTING OF TREATED OBSTRUCTIVE SLEEP APNEA

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Introduction: There is a possible association between OSA and vitamin D deficiency (Neighbors 2018). Vitamin D deficiency is associated with fatigue and excessive daytime sleepiness (EDS) (Bouloukaki 2022). Vitamin D deficiency might play a role in the residual fatigue or sleepiness seen in some patients with treated OSA.

Report of case(s): We present a 28 year old female with RLS, anxiety and mild OSA with persistent daytime fatigue and sleepiness despite optimal treatment of OSA. She was evaluated for OSA via a HST due to symptoms of snoring, overnight awakenings, non-restorative sleep, and EDS (Epworth Sleepiness Scale (ESS) of 11/24). The HST revealed mild OSA (REI 4% of 11). Bloodwork revealed a ferritin of 31 ng/mL. She was treated with autoPAP 5-15 cm and daily ferrous sulfate 325 mg. At follow-up she reported significant improvement in her RLS. Repeat ferritin level was 59 ng/ml and continued iron supplementation was recommended. Despite 98% (40/41 days) compliance and effective treatment of OSA with residual AHI of 0.9, she continued to report persistent daytime fatigue and EDS. Given the residual symptoms we checked a vitamin D level which was reduced at 7 ng/mL (21-100 ng/mL).

Conclusion: We identified in the sleep medicine literature a case report of a 28 yo patient with EDS who had significant improvement in symptoms after her vitamin D deficiency (5.9 ng/mL) was treated. This woman had improvement in her ESS from 10/24 to 1/24 (McCarty 2010). This patient, however, did not have OSA which was the case with our patient. This report speculated that a possible mechanism for clinical improvement could include enhanced sleep quality due to resolution of hypovitaminosis D-associated non-inflammatory myopathy, or a possible immunomodulatory effect of vitamin D decreasing central nervous system homeostatic sleep pressure. Residual fatigue and EDS in the treatment of OSA may have multiple causes for which a comprehensive approach can help identify and treat the underlying cause.

Support (if any): Vitamin D and obstructive sleep apnea: a systematic review and meta-analysis (Neighbors 2018) Vitamin D levels in primary care patients: correlations with clinical, seasonal, and quality-of-life parameters (Bouloukaki 2022) Resolution of Hypersomnia Following Identification and Treatment of Vitamin D Deficiency (McCarty 2010)

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1006

HOW INSOMNIA MASKED A YOUNG MAN'S FIRST EPISODE PSYCHOSIS

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Introduction: Sleep disturbance is a common sign across many mental health disorders. Particularly, insomnia is a frequent issue among patients with mood disorders. However, there is increasing evidence that suggests that sleep disturbance may be a risk factor for developing psychosis, or conversely, an early warning sign of psychosis. In this case report, we describe a young patient's first episode of psychosis, which was masked by an initial presentation of insomnia, diagnosed as major depressive disorder, and the patient decompensated further until his psychosis was appropriately diagnosed and treated.

Report of case(s): A 20-year-old African-American male was evaluated at a major tertiary hospital after he was found calling his mother while crying and speaking incoherently. He was eventually admitted there for two weeks with the diagnosis of Major Depressive Disorder, and discharged on Bupropion 300 milligrams(mg) daily for depression, with Quetiapine 50mg and Trazodone 100mg at night for sleep. Following discharge from this hospital, the patient's psychiatric history was significant only for one additional outpatient psychiatry clinic visit at a major community hospital, where he was again diagnosed with Major Depressive Disorder, and prescribed Zoloft 25mg daily. The patient eventually presented to our hospital with reports of worsening depression, poor sleep, poor appetite, and more recently, increasingly bizarre behavior. The patient initially presented to the unit disorganized (nursing staff frequently described patient as looking "lost"), staring blankly at the walls, internally preoccupied and laughing inappropriately as if responding to internal stimuli. Patient had episodes of emotional outbursts with aggression and bizarre behavior that required emergent medication. The patient's Bupropion was discontinued in favor of oral Risperidone, titrated up to 4mg twice daily. Patient's symptoms, including his sleep, gradually improved with the single antipsychotic regimen, and was eventually discharged after returning to his baseline. Patient was also evaluated by a clinical psychology team who also supported the assessment of first episode of psychosis.

Conclusion: This case highlights the importance of evaluating sleep disturbances in accurately diagnosing mental disorders. Studies show sleep is an important risk factor in the precipitation of many mental illnesses, while sleep disturbances are also frequently resolved by treating the underlying mental illness.

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1007

EXCESSIVE REM WITHOUT ATONIA IN ADULT TRISOMY 21 PATIENT

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Introduction: REM sleep without atonia (RSWA) is associated with synucleinopathy neurodegenerative disorders; however,

poorly described in other neurodegenerative disorders. We present an adult with trisomy 21, associated with higher risk of Alzheimer's, with elevated REM percentage and RSWA.

Report of case(s): 37-year-old with Trisomy 21 and reported compliance on CPAP, prescribed ropinirole 0.25mg, clomipramine 50mg qHS and sertraline 100mg, underwent titration study to ensure OSA control in setting of worsened insomnia, restless sleep and nightmares. Reported nightmares starting after hospitalization year prior; patient couldn't remember dreams, but felt they were "bad". Denied dream enactment but moved a lot in his sleep and his dog no longer would sleep with him. Study found significantly elevated REM at 49.8%. Of 484 epochs of REM, 38% met RSWA with excessive transient muscle activity in REM based on AASM Manual for Scoring of Sleep and Associated Events(V2.6). OSA remained controlled throughout study near currently prescribed pressures, overall CMS AHI 2.7 (diagnostic in 2009 with CMS AHI 53.7).

Conclusion: Adult Trisomy 21 patient with excessive phasic activity during REM of unknown cause, no reported dream enactment. As patient's dog no longer willing to co-sleep, could question if related to excessive movement. While patient is on sertraline, known to increase RSWA(1), the amount of excessive REM meeting RSWA criteria makes us question for this to be sole cause. Despite lack of dream recall, felt were "bad" since hospitalization, raising Trauma-associated sleep disorder as possibility. However, lack of autonomic hyperarousal and inability to confirm dreams related to trauma makes less likely(2). Limited studies of adult Trisomy 21 patients noted findings of RSWA(1). Currently there's established association with RBD, most well studied form of RSWA, and synucleinopathy neurodegenerative disorders. Rarely studies report RBD phenoconverting into Alzheimer's disease(1). While known association with Alzheimer's and Trisomy 21, frequency of Trisomy 21 and other neurodegenerative disorders is less established. As this population ages, close monitoring for development of neurodegenerative disorders is needed.

Support (if any): (1)Baltzan M. Dream enactment behavior: review for the clinician. 2020 (2)Barone D. Dream enactment behavior-a real nightmare: a review of post-traumatic stress disorder, REM sleep behavior disorder and trauma-associated sleep disorder. 2020

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1008

EXCESSIVE DAYTIME SLEEPINESS IN MYOTONIC DYSTROPHY TREATED WITH MODAFINIL

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Introduction: Physiology of excessive daytime sleepiness (EDS) in myotonic dystrophy type 1 (DM1) remains incompletely understood and best practice treatment approaches are unclear.

Report of case(s): We present a 73-year-old man with atrial fibrillation, implantable cardioverter defibrillator for inducible ventricular tachycardia, hypertension, and severe obstructive sleep apnea (OSA) was referred after a recent diagnosis of myotonic dystrophy type 1 (DM1) for EDS. He presented with foot pain, balance issues, and falls. A subdural hemorrhage from a fall prompted thorough evaluation including electromyography. This showed length-dependent polyneuropathy

type pattern with features of subacute and chronic denervation change and myotonic discharges in right vastus medialis and bilateral tibialis anterior and gastrocnemius muscles. Myotonic Syndrome Advanced Evaluation revealed with a repeat expansion mutation in DMPK gene (85 and 13 CTG repeats). He was previously diagnosed severe OSA with an AHI of 64 and titrated onto bilevel. He recalled no improvement in symptoms with bilevel. He noted sleeping 10-12 hours per night and feeling rested. However, he takes multiple times per day for hours at a time. When actively working on tasks he feels alert and focused. Epworth sleepiness scale (ESS) was 12. Polysomnogram on bilevel followed by MSLT demonstrated control of OSA and mean sleep onset latency of 8 minutes and 5 sleep onset REM periods. With relatively little impairment and a desire for intermittent improved wakefulness, he was started on modafinil 200mg daily as needed. He reported a robust response to modafinil without the need for additional naps or cardiac complications thus far. Repeat ESS only improved to 10.

Conclusion: This case highlights the need for a precision medicine approach as subpopulations exist even within the specific diagnosis excessive daytime sleepiness in myotonic dystrophy. People with DM1 have been similarly reported with little improvement in ESS but dramatic subjective improvement in symptoms with modafinil. A Cochrane Review and a European Medicines Agency recommendations on modafinil are not supportive of its use in DM1 despite a subpopulation with a clear response. Interestingly, clinical measures do not seem to predict response to modafinil, suggesting unmeasured and, potentially, varied pathologies of excessive daytime sleepiness in DM1.

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1009

SURGERY: PROBLEM AND SOLUTION. TEMPOROMANDIBULAR JOINT RECONSTRUCTION FOR TREATING OBSTRUCTIVE SLEEP APNEA AFTER COSMETIC SURGERY.

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Introduction: Orthognathic surgery is often considered for the treatment of obstructive sleep apnea (OSA); however, in some circumstances, specific interventions may precipitate OSA.

Report of case(s): A 34 year-old female presented with complaints of snoring and fragmented sleep. She had undergone bimaxillary osteotomy and mandibuloplasty for cosmetic reasons outside of the country in 2019. Prior to the surgery, she was asymptomatic and did not snore. Post operatively, she developed snoring, witnessed apneas, fragmented sleep, and daytime sleepiness. A home sleep apnea test revealed severe obstructive sleep apnea with Respiratory Event Index (REI) 66.4/hr. She was initially treated with Positive Airway Pressure (PAP) while seeking oral surgery consultation. PAP via nasal mask was initially effective with residual Apnea Hypopnea Index (AHI) of 3/hr., but the patient developed difficulty tolerating PAP due to aerophagia, nausea, and eructation, despite limiting pressures to 5-7cm H₂O. In 2022, the patient successfully underwent temporomandibular joint (TMJ) reconstruction with total joint

prosthesis, TMJ fat grafting, bilateral coronoidectomy, maxillary osteotomy with bone plate and grafting, and partial inferior turbinatectomy. She reported resolution of snoring and significant symptomatic improvement after surgical revision. Repeat home sleep apnea testing 1 month after the surgery revealed REI 0.6/hr.

Conclusion: This case illustrates the potential for development of OSA following orthognathic surgery. Patients and providers should be aware of this potential complication when pursuing surgical intervention.

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1010

CHEYNE-STOKES RESPIRATION IN A FULL TERM INFANT POST ECMO RESUSCITATION

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Introduction: Cheyne-Stokes Respiration (CSR) is a form of central sleep apnea (CSA) characterized by periods of hyperventilation and apneas or hypopneas. This is a case of a full-term neonate who presented with acute respiratory failure, requiring ECMO, secondary to late-onset sepsis with Legionella infection. Polysomnography (PSG) obtained post ECMO decannulation showed apneas with CSR. This is a rare finding in neonates and the causes, prevalence, progression, and outcomes of CSA-CSR in pediatric population remains unclear.

Report of case(s): A 3-week-old full term male infant with no perinatal complications, presented in acute respiratory failure, following an apneic event at home that required resuscitation. He was intubated and placed on VA-ECMO due to hemodynamic instability for a period of 7 days. Extensive sepsis work-up revealed Legionella infection for which he was appropriately treated. Post decannulation he continued to require oxygen support for a prolonged period, with notable desaturations during sleep. PSG showed severe obstructive sleep apnea (oAHI 37/hr) and central sleep apnea (CAI 20/hr) with the unusual finding of CSR, almost throughout the study. Oxygen titration was done and 0.5L of oxygen via nasal cannula showed marked decrease in OSA(oAHI 7/hr) and CSA(CAI 2/hr). Given these PSG findings echocardiography and brain MRI were obtained and were both normal. CT scan of chest showed diffuse pulmonary edema, hence the patient was started on diuretics. After 3 weeks of diuretic therapy, repeat PSG demonstrated complete resolution of CSA-CSR. Patient was discharged home with nighttime oxygen.

Conclusion: CSR has been associated with heart failure and stroke in adults resulting in unstable control of breathing. In Pediatrics, CSA-CSR has been predominantly described only in premature infants. Our patient was a full-term neonate who had a complicated course with rare Legionella and ECMO leading to severe pulmonary disease including pulmonary edema. We postulate that CSR was secondary to the latter due to positive diuretic response.

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1011

HEART RACING CASE OF DYSAUTONOMIA IN PEDIATRIC HYPERSOMNIAHema Mekala¹, Ameer Revana², Lacie Petitto³, Meghana Pattipati⁴¹ Baylor College of Medicine - Houston, TX, ² Children's Sleep Center, Texas Children's Hospital/Baylor College of Medicine, Houston, TX, United States, ³ Texas Children's Hospital, ⁴ Baylor College of Medicine

Introduction: Central disorders of hypersomnolence are rare sleep disorders that are commonly misdiagnosed in the pediatric population. Autonomic dysfunction is commonly associated with narcolepsy and may be underrecognized. To our knowledge there is only one case study in the literature, discussing both dysautonomia and pediatric narcolepsy in the setting of hyperhomocysteinemia. We present an 18-year-old female undergoing gender transformation with suspected narcolepsy type 2, major depression, suicidal ideation and dysautonomia (dizziness, tachycardia, and near syncopal episodes).

Report of case(s): At age 16 years, he was evaluated for excessive daytime sleepiness (EDS). Polysomnography (PSG) recorded an apnea hypopnea index (AHI) of 4/hour. Given previous tonsillectomy and adenoidectomy, he was titrated on continuous positive airway pressure (CPAP) which was not well tolerated. Two years later his daytime sleepiness and PAP intolerance continued. A repeat PSG with added mean sleep latency test (MSLT) recorded the following: AHI of 7.9/hr, mean sleep onset latency of 14.8 minutes with one sleep onset REM period (1/5 naps). The study was completed while on psychiatric medications (Abilify, Cymbalta) due to concerns for suicide. Subsequently, he was started on auto-PAP and was referred to sleep psychology for PAP desensitization. Given the concern of psychiatric medications compromising the results of the MSLT, wake promoting pharmaceuticals (stimulants, Modafinil, Strattera) were prescribed due to continued EDS which failed. Additional relevant diagnostics included a positive anti-nuclear antibody (ANA) and normal brain MRI. Reports of tachycardia while awake and palpitations during sleep further warranted a cardiology referral given previously recorded tachycardia during clinic encounters. Cardiology evaluation concluded severe autonomic dysfunction with neurocardiogenic syncope resulting in treatment with Florinef and propranolol which improved symptoms.

Conclusion: Diagnosis and management of central disorders of hypersomnolence can be challenging and complex especially in those with underlying psychiatric disorders. Careful consideration for screening for autonomic dysfunction in this population should be considered in order to help improve overall quality of life.

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1012

SLEEP DISORDERED BREATHING IN CHILDREN WITH CONGENITAL MYASTHENIC SYNDROMELaura Miller¹, Neha Patel¹, Raanan Arens¹, Leslie Delfiner¹¹ The Children's Hospital at Montefiore

Introduction: Congenital Myasthenic Syndromes (CMS) include a group of heterogeneous disorders encompassing the neuromuscular junction. These disorders have a wide range of clinical

presentations according to the degree and group of muscles involved. While some children can present with modest muscle weakness, others present with significant hypotonia, or even respiratory failure. The natural history of CMS, and in particular, the diagnostic role of polysomnography (PSG) in these children, is not well documented.

Report of case(s): Retrospective chart review via EMR in a large tertiary center. Patient 1. 19-month-old male with VAMP-1 gene mutation, treated with pyridostigmine, underwent a PSG to evaluate for sleep disordered breathing (SDB). The PSG demonstrated an AHI of 17.7. Repeat PSG post adenoidectomy showed an obstructive apnea hypopnea index (OAH) 8.6, and central apnea index (CAI) 1.2. He was started on 0.5 LPM oxygen for sleep. Patient 2. 2-year-old female with GFPT1 gene mutation, chronic respiratory failure, tracheostomy/ventilator dependent had a PSG with tracheostomy uncapped on room air which showed an OAH 1.7, and CAI 0.3. Four years later, split night PSG was started on room air which showed an OAH 2.8, and CAI 4.6. The ventilator was added at patient's home settings which improved sleep quality and resolved respiratory events. She was continued on home ventilator settings for sleep despite pharmacological treatment with pyridostigmine. Patient 3. 3-year-old male with CHRNE gene mutation and treated with pyridostigmine. He was evaluated for SDB due to snoring. The PSG demonstrated an OAH 3.4, and CAI 1.4. Repeat PSG post adenotonsillectomy showed an OAH 0.4, and CAI 0.4. A third PSG at age 5 was normal.

Conclusion: We present 3 children with various mutations leading to CMS. The heterogeneity in the clinical course, response to therapy, and outcome may be related to genetic mutations, severity of the disorder and muscles involved, time of diagnosis and medical response to treatment. Polysomnography is an important modality for diagnosis of SDB as well as to monitor response to treatment over time. We conclude that patients with CMS should have a PSG completed given this increased risk.

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1013

A FAMILIAL AND BENIGN CASE OF REM BEHAVIORAL SLEEP DISORDER?Mariam Mirza¹, Ikuyo Imayama², Muhammad Najjar³¹ University of Illinois at Chicago Hospital, ² University of Illinois at Chicago, ³ University of Illinois, Chicago

Introduction: REM sleep behavior disorder (RBD) is a rare condition characterized by abnormal sleep behavior, such as dream enactment. Loss of atonia during REM sleep is noted in polysomnography (PSG). Failure to suppress spinal motor neurons is considered its pathophysiology. Etiologies include neurodegeneration, orexin deficiency, structural brain lesions, or medication effects. Although studies have shown that most patients with RBD develop neurodegenerative disorders, the variable etiologies suggest that prognosis of RBD can potentially be variable. We report a case of RBD with a significant family history without development of a neurodegenerative disorder.

Report of case(s): A 64-year-old woman with hypertension, diabetes, body mass index of 29 kg/m², and tobacco use presented with dream enactment for 10 years. She was referred by her neurologist, who she had seen for intermittent hand tremors

but had no focal abnormalities on her neurological exam. She complained of snoring, daytime sleepiness, and unrefreshed sleep. Her medications were aspirin, hydrochlorothiazide-val-sartan, metformin, and pantoprazole. She denied any traumatic experience. Family history was relevant for dream enactment in her younger sister and both parents, with an age of onset in their early 50s in all. None of these relatives had any reported neurological issues. Labs revealed abnormal SPEP, an IgG kappa band, which can be an early presentation of monoclonal gammopathy of undetermined significance (MGUS). She had PSG with an extended electroencephalogram (EEG) monitor, which showed REM atonia consistent with RBD. She shouted, talked, and moved limbs during REM sleep. No evidence of sleep apnea was seen. She took melatonin 3 mg without any improvement. A trial of clonazepam 0.25 mg reduced the frequency of dream enactment and helped her anxiety. We plan to increase melatonin dosing and observe her response.

Conclusion: Our patient had dream enactment for over 10 years but has not developed any neurological abnormalities to date. She has a family history of dream reenactment with the age of onset in early 50s without any neurological associations. Due to variable etiologies of RBD, this case may be a subtype of RBD with a benign clinical course.

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1014

THE PANDA MONSTER UNDER THE BED

Ann Oh¹, Alon Avidan¹

¹ UCLA

Introduction: Pediatric Autoimmune Neuropsychiatric Disorder Associated with Streptococcus (PANDAS) is an acute-onset constellation of symptoms including obsessive-compulsive disorder and concurrent neuropsychiatric symptoms including anxiety, emotional lability, and behavioral regression. Sleep disturbances are common in PANDAS, suspected of post-infectious inflammation that can decrease serotonin, increase dopamine, and prevent the production of melatonin. OCD fears and rituals can create may impede sleep onset and impair sleep maintenance. Abnormal motor manifestations during sleep include restlessness, stereotypies, paroxysms or periodic limb movements during sleep. This case report highlights the clinical time course of sleep disorders found in chronic PANDAS, refractory to immunomodulatory interventions.

Report of case(s): We present the case of an 11-year-old male who presented with behavioral insomnia of childhood sleep-onset association type in the setting of personality changes and deterioration of school performance coinciding with streptococcus infection two months earlier. The patient was supported with prophylaxis antistreptococcal therapy as well as Omega-3 fatty acids. Parents noted heightened anxiety during the day, fear of obsessive and intrusive thoughts about becoming sick, and social seclusion but refusal to sleep alone and be away from home. He was also diagnosed with a tic disorder, chronic migraine, and postural orthostatic tachycardia syndrome (POTS), which likely exacerbated insomnia. The patient was referred for Cognitive behavior therapy utilizing exposure/response prevention ERP modality and psychoeducation. However, it was not until clonidine was introduced that the patient demonstrated a significant clinical response.

Clonidine was initiated at 50ug and increased to 100ug QHS. It likely promotes sedation by decreasing norepinephrine release via negative feedback by agonism of the α_2 -adrenergic receptors at the level of the locus coeruleus.

Conclusion: Sleep disorders in PANDAS syndrome remain elusive and challenging to manage due to the lack of well-developed pharmacologic guidelines to treat insomnia in children. Our case illustrates the importance of the integration of pharmacologic treatments to augment behavioral strategies and promote better patient outcomes. More studies are needed to investigate the pharmacologic management of sleep disorders in children in general, but appraise the safety and efficacy of specific medications such, as clonidine, in particular.

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1015

CHASING AFTER SLEEP IN ROHHAD SYNDROME

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Introduction: Rapid-onset obesity with hypothalamic dysfunction, hypoventilation, autonomic dysregulation, (ROHHAD) syndrome is a childhood disorder consisting of rapid-onset obesity with hypothalamic dysfunction, hypoventilation, and autonomic dysregulation. Sleep disordered breathing, obesity hypoventilation, and daytime hypersomnia are common sleep conditions found in this syndrome. The purpose of this case report is to review the polysomnography findings and propose a multidisciplinary approach in treating a patient with ROHHAD syndrome.

Report of case(s): This is a case of a 5-year-old female with a clinical presentation consistent with ROHHAD who experienced daytime hypersomnia and worsening obesity hypoventilation due to the progressive nature of her disease. We report the use of several wake-promoting pharmacological agents, in conjunction with positive airway pressure (PAP) therapy to improve quality of life and reduce burden of disease.

Conclusion: Early detection and treatment of sleep disorders in patients with ROHHAD syndrome are essential to improve health outcomes. Given the complex, evolving clinical course of this disease, these patients are best served by coordinated, multi-specialty care.

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1016

JERKY NIGHT: PROPRIOSPINAL MYOCLONUS AT SLEEP ONSET AFTER METOCLOPRAMIDE USE DURING PREGNANCY

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Introduction: Propriospinal myoclonus (PSM) at sleep onset is characterized by jerks of axial muscles, spreading caudally and rostrally, during the transition from wakefulness to sleep¹. We present a rare case of a patient who suffered severe sleep-onset insomnia due to PSM after metoclopramide use during pregnancy.

Report of case(s): A 30-year-old woman with a history of well-controlled herpes simplex virus (HSV) and a resected atypical

serous borderline ovarian tumor with microinvasion, presented after a 2-year bout of insomnia due to electrical, jerking sensations in her torso, spreading to the legs just before falling asleep. The symptoms began after an 18-week trial of metoclopramide 20mg, for severe reflux with esophagitis during pregnancy, and persisted after discontinuation of metoclopramide, and postpartum, periodically worsening with menses. On first presentation, the neurological exam was unremarkable; polysomnography was conducted, showing brief myoclonic jerks of the upper extremity, with increased EMG tone and muscle artifact, preventing sleep onset, allowing a total sleep time of merely 1 hour 10 minutes. Event - related recordings on simultaneous electromyogram (EMG)/electroencephalogram (EEG), showed mixed movement disorder and suggested mild CNS hyperexcitability with some volitional muscle jerks, and some myoclonic jerks. An earlier trial of clonazepam 1mg nightly partially improved her symptoms, but caused panic, suicidal ideation, and depression. Month-long, nightly Diphenhydramine 50mg and Trazodone 100mg initially helped with insomnia, while Doxepin 10mg/mL, Daridorexant 25mg, Tizanidine, Gabapentin 900mg, Zolpidem, Cyclobenzaprine, Levetiracetam 500mg, Carbidopa-Levodopa, and sleep restriction all proved ineffective. Eventually, she underwent another trial of clonazepam at 0.25mg with slow titration to 0.75mg while adding melatonin 10mg, without adverse effects noted.

Conclusion: Our case of PSM at sleep onset was in the context of metoclopramide use during pregnancy. Uniquely, adverse effects were associated with a higher and rapid titration of Clonazepam, but later improved with a lower dose and slower titration, coupled with Melatonin. Notably, both dopamine agonists and antagonists, also cannabis, nitric oxide, interferon, ciprofloxacin, bupivacaine, spinal anesthesia, all have reportedly caused medication-induced myoclonus. Further, reports on similar cases may aid in understanding better the pathophysiology of this rare, disabling condition, and lead to more rapid, effective treatment.

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1017

LAUGHING IN THE FACE OF LAUGHTER: NARCOLEPSY WITH SEVERE CATAPLEXY REFRACTORY TO MEDICATION: A CASE REPORT

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Introduction: Cataplexy, a transient muscle atonia, typically occurs in response to positive emotions such as laughter or mirth. Cataplexy occurs in association with hypocretin deficiency/narcolepsy type 1 (NT1) and involves descending REM sleep-motor inhibition pathways. 1. Here we present a case with late-onset NT1, refractory to medication.

Report of case(s): A 65-year-old man with a normal BMI presented to the autonomic clinic for presumed syncope, facial and leg weakness, occurring up to 50 times daily, triggered by laughter and a stressful life event from 4 years prior. Tilt testing and brain magnetic resonance imaging, were unremarkable, while sleep-deprived electroencephalogram was concerning for cataplectic versus functional attacks. He underwent diagnostic polysomnography (PSG) that showed

severe obstructive sleep apnea (OSA) and was treated with bilevel positive airway pressure (BPAP). A repeat PSG after his OSA was controlled on BPAP, followed by a multiple sleep latency test the next day, showed a mean sleep latency of 2.7, and sleep onset rapid eye movement in 3 of 5 naps; cerebrospinal fluid hypocretin was undetectable and DQB1*06:02 was positive. He denied sleep paralysis and sleepiness, and jovial by nature, he joked as a hobby, leading to cataplexy. Trials of sodium oxybate was ineffective causing vivid dreams and hallucinations. Venlafaxine was subsequently added, initially controlling his cataplexy, but lost efficacy, warranting a trial of duloxetine, also ineffective. He was then started on solriamfetol, which improved sleepiness. We attempted to enroll him in a clinical trial of Reboxetine, thereby discontinuing duloxetine; severe OSA disqualified him from the trial. Subsequently, status cataplecticus ensued, leading to abolished reflexes and multiple falls. Clomipramine 100mg and Modafinil 200mg was started, reportedly reducing the frequency of cataplexy to 12 episodes daily.

Conclusion: Our case is notable because of the challenges working through the differential of drop attacks, and his late onset of severe NT1. One suggestion is an associated functional component to the disease could be involved, and though the diagnosis is solid, an additional functional overlay, or his joking personality, render symptom control unusually difficult. This case illustrates complexities of some cases with late-onset NT1.

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1018

FINALLY AWAKE: TREATMENT OF SEVERE REM-ISOLATED OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is typically treated with positive airway pressure (PAP) therapy in symptomatic patients with ≥ 5 obstructive respiratory events (apneas, hypopneas or respiratory effort related arousals) per hour of sleep. In this case, we present a patient with severe OSA isolated to REM sleep who demonstrated significant symptomatic improvement on PAP therapy, despite an overall apnea-hypopnea index (AHI) of less than 5 events/hour.

Report of case(s): A 73-year-old obese male with history of SVT, hypertension, and diabetes presented with symptoms of snoring, witnessed apneas, non-restorative sleep, restless sleep, excessive daytime sleepiness, and fatigue. A baseline polysomnogram (PSG) demonstrated severe OSA exclusively in REM sleep (overall AHI 2.9, REM AHI of 37.3, minimum SpO₂ of 84%). A subsequent PAP titration study tested CPAP 5-17 and BPAP 19/15 cm of water but was unable to identify an effective pressure during REM sleep. Pressures as low as CPAP 5 cm of water appeared effective in NREM sleep. Ultimately, as the patient was unwilling to undergo a re-titration study, empiric treatment with auto-BPAP (min EPAP 5, max IPAP 25, PS 4) was initiated. With excellent adherence to BPAP therapy, the patient experienced profound symptomatic benefit, with resolution of daytime symptoms, less restlessness during sleep, and more restorative sleep.

Conclusion: This case highlights a gap, and potential pitfall, in current practice. Our patient 1) did not meet the overall AHI criteria for diagnosis of OSA yet had typical symptoms and high

pretest probability for OSA; 2) had a PSG which showed severe OSA exclusively during REM sleep; and 3) experienced resolution of symptoms with PAP therapy. Presently, there is no consensus on whether REM-dependent OSA should be treated if the overall AHI is < 5 events/hour. In fact, there is no standardized definition for REM-dependent OSA. This patient with cardiovascular risk factors was able to receive PAP therapy through the Veterans' Affairs, and access to PAP therapy changed the Veteran's quality of life dramatically. Obtaining a PAP device for this patient through private payors would have been nearly impossible. More research is needed to understand the clinical implications of this condition.

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1019

NEW ONSET OSA AFTER LONG TERM VAGUS NERVE STIMULATOR IMPLANTATION IN A PATIENT WITH LENNOX-GASTAUT SYNDROME: A CASE REPORT

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Introduction: Implantable vagus nerve stimulation (VNS) is an established treatment for drug resistant epilepsy. New onset obstructive sleep apnea (OSA) is a rare side effect of VNS. There are few studies describing VNS induced sleep apnea in adults. [1-2] A study of 16 patients with drug-refractory epilepsy found 5 patients with normal AHI develop mild OSA after VNS treatment for 3 months. [2] However, no literature exists regarding OSA after long term VNS implantation. Untreated OSA in patients with epilepsy can impact epilepsy outcomes. We report a case of new onset OSA after long term VNS implantation, refractory to PAP therapy.

Report of case(s): A 36 year-old man with Lennox-Gastaut syndrome presented with gasping during sleep and daytime hypersomnolence. He underwent VNS implantation at the age of 12. A prior PSG in 2018 showed no sleep apnea. Repeat PSG showed VNS-induced OSA (AHI 10.1/hour). After failed CPAP titration, BPAP-S at 25/16 cm H₂O improved OSA. Review of therapy data on follow up showed AHI of 13.7/hour and CAI of 10.9/hour, which is concerning for treatment induced central sleep apnea on BPAP. Diagnostic study with VNS turned off revealed mild OSA (AHI 5.8/hour). A multidisciplinary approach involving ENT for drug-induced sleep endoscopy to optimize VNS stimulation parameters along with neurology and sleep involvement is planned. The optimized VNS setting could be used during planned sleep times using a VNS device with dual-programming capability.

Conclusion: To our knowledge, there is no literature on development of sleep apnea after long term VNS implantation. Although the exact mechanism is unknown, VNS can cause sleep apnea or worsen sleep apnea in patients with a preexisting diagnosis. [1] This case demonstrates need for continuous monitoring and screening for sleep apnea in patients who have been implanted with VNS, even if baseline and follow up PGs are normal. Current literature suggests discontinuation of VNS to resolve VNS-induced OSA, but we describe a case here where VNS is needed for ongoing management of epilepsy. Further studies are needed to identify treatment options for patients that cannot discontinue VNS therapy who also cannot be successfully treated with PAP if they develop VNS-induced OSA.

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1020

MODAFINIL INDUCED PSYCHOSIS

Harvey Patel¹, Harvey Patel¹

¹ MCW

Introduction: Modafinil has been used for the treatment of numerous different conditions, including daytime somnolence (EDS). Modafinil is a non-amphetamine central nervous system (CNS) stimulant with wakefulness-promoting properties. There have been few reported cases of psychosis associated with modafinil use, however a large majority of those were seen in patients with a history of primary psychiatric disturbances.

Report of case(s): We present a case of a 48 year old female coming for evaluation of excessive daytime somnolence. She completed polysomnography and a multi sleep latency test (MSLT) which revealed mildly elevated AHI, but no sleep onset rapid eye movements (SOREMPs). A diagnosis of idiopathic hypersomnia was subsequently made and 200mg of modafinil up to twice daily was prescribed for her. Patient initially tolerated the modafinil well, however she began having delusions and she subsequently required psychiatric evaluation. These delusions primarily consisted of her believing she was under surveillance and had conspiracy theories against her. She also described having auditory hallucinations as well, especially voices telling her about these conspiracy theories. She also demonstrated poor insight into her medical condition as she refused to discontinue modafinil. Upon evaluation, routine labs including complete blood count, chemistry profile and urine drug screens were completed to rule out any secondary causes of psychosis. It was therefore recommended by psychiatry to discontinue modafinil as there was concern that the delusions were occurring secondary to medication use. The patient's psychotic delusions seemed to dissipate after this. A multidisciplinary meeting was held regarding management of patients' excessive daytime sleepiness (EDS) and a decision was made to begin the patient on pitolisant, a histamine receptor antagonist. The patient was able to achieve great benefit with this medication.

Conclusion: The presented case illustrates a patient who began having psychosis after beginning modafinil 200mg twice daily. Psychosis is a much more rare side of modafinil and providers should become aware of it. Therefore, patients who are prescribed modafinil should be carefully followed for psychosis development, even when they are previously healthy and have no history of any primary psychiatric conditions.

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1021

AN 8-YEAR-OLD CHILD WITH ROHAAD SYNDROME AND ITS COMORBID ASSOCIATION WITH NARCOLEPSY, CARDIOMYOPATHY, AND MALIGNANT CATATONIA

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Introduction: Rapid-onset obesity with hypothalamic dysregulation, hypoventilation, and autonomic dysregulation (ROHHAD)

is a rare disease with an unknown etiology. It manifests with varying clinical signs making the diagnosis challenging. We present a case of ROHHAD syndrome with narcolepsy, heart failure with cardiomyopathy, and malignant catatonia.

Report of case(s): An 8-year-old boy with speech and developmental delay presents to sleep clinic at 4 years of age, with snoring, witnessed apneas during sleep, daytime somnolence and obesity for evaluation of obstructive sleep apnea. At three years of age, he started to gain weight rapidly; with an increase in BMI from 26 to 30 over a period of few months. His weight gain was initially attributed to a high caloric diet and sedentary lifestyle. A baseline polysomnogram revealed mild obstructive sleep apnea without hypoxemia or hypoventilation (oRDI of 4.2, oxygen nadir 90%, CAI 1). Over time, he was admitted multiple times for hypernatremia, respiratory failure with hypoxemia and hypercapnia, psychosis, and fever of unknown origin. After a thorough evaluation, the diagnosis of ROHHAD was made based upon his history of rapid weight gain, hyperthermia, respiratory failure with hypercapnia, hypopituitarism, and hypothyroidism. During one of his admissions for altered mental status the patient manifested agitation, auditory and visual hallucinations, and excessive daytime sleepiness. Due to these behavioral changes, cerebral spinal fluid was obtained showing a hypocretin of < 50pg/ml. Based on the low hypocretin levels, daytime sleepiness, and hallucinations; a diagnosis of narcolepsy type 1 was made. He subsequently developed heart failure with severely dilated cardiomyopathy and depressed contractility. The patient was deemed not a candidate for heart transplant due to his underlying comorbidities. He unfortunately died at the age of 8 years due to complications from advanced heart failure.

Conclusion: ROHHAD is a rare and fatal disease that can manifest in several ways. ROHHAD with coexistent narcolepsy, malignant catatonia and cardiomyopathy is extremely rare presentation. Providers need to be aware of the varying clinical presentations and have a high index of suspicion in diagnosing this condition. Early diagnosis might improve the morbidity and mortality.

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1022

TWO TEENAGERS WITH NEW ONSET INSOMNIA POST COVID.

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Introduction: Sleep disturbances are increasingly seen in COVID-19 infection. Multiple reports have described the onset of insomnia, excessive daytime sleepiness, and fatigue in patients with both acute COVID infection and long COVID syndrome. Most of these are limited to adults. We report the cases of 2 teenagers with new onset chronic insomnia post COVID-19 infection.

Report of case(s): The first patient is a 14-year-old male who presented with sleep onset and sleep maintenance insomnia, excessive daytime sleepiness, difficulty concentrating, fatigue, and chronic cough, with onset five months prior presentation to the sleep clinic. He developed these symptoms after testing positive

for COVID-19. He had significant impairment with multiple school absences and tardies for which he required accommodation. He completed a 2-week actigraphy test which showed prolonged sleep latencies and insufficient sleep. He was scheduled for polysomnography (PSG) followed by a multiple sleep latency test (MSLT) but could not proceed to MSLT due to insufficient sleep the night before. The PSG did not reveal either obstructive sleep apnea or periodic limb movements of sleep. His laboratory testing was significant for a low ferritin level of 21. He was referred for IV iron infusion due to intolerance for oral iron. He was started on melatonin without benefit. He was offered clonidine and trazodone but declined. The second patient, a 17-year-old male, presented with insomnia of 3 months duration which started after an acute COVID infection. In addition to insomnia, he had comorbid mood symptoms. He went from being engaged in school and work to being unmotivated and listless. His actigraphy testing revealed he was having sufficient sleep on several days during which he reported not getting any sleep. He failed trials of multiple medications including melatonin, trazodone, hydroxyzine, and gabapentin. He also denied benefit with CBT-I.

Conclusion: These case reports link COVID 19 and chronic insomnia in pediatric patients. While it is yet unclear whether the development of sleep disturbances post COVID is as a result of an intrinsic characteristic of the COVID-19 virus or the biopsychosocial effects of the pandemic, it is important to develop and implement targeted interventions focused on recognizing and treating insomnia early.

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1023

A CASE OF STRIDOR IN THE SLEEP CLINIC

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Introduction: Multisystem atrophy (MSA) is a neurological degenerative progressive disease affecting multiple systems. These patients are frequently seen in the sleep clinic at specialty centers by sleep neurologists for co-management of sleep disordered breathing and nocturnal respiratory issues. Stridor is a life-threatening condition seen in these patients and requires emergent action. We present a case of MSA with worsening stridor that was missed in the era of virtual telemedicine.

Report of case(s): A 53-year-old female with a history of obstructive sleep apnea (OSA) on BiPAP S and multiple system atrophy with parkinsonian subtype presented virtually to sleep clinic for follow up evaluation of her sleep disordered breathing. Six months prior to her visit she was noted to have bilateral vocal fold hypomobility without stridor. At that time, she had a residual apnea-hypopnea index (AHI) of 1.4 with BiPAP-S 16/13 cm H₂O and no nocturnal stridor. She was wheelchair bound. She had routine follow up visits with various providers however these were telemedicine visits with her husband doing most of the talking due to weakness. Over the next 5 months she had worsening fatigue and was using BiPAP S during the day intermittently and was referred to the sleep medicine clinic for consideration of supplemental oxygen at night. A repeat overnight oximetry revealed residual oxygen desaturation index (ODI) of 2.5/hr while on BiPAP S. Repeat pulmonary function testing was ordered and patient was recommended to return for immediate in person follow up. When seen in person, patient was noted to

have significant stridor which had been ongoing and worsening over last few months including being appreciated while on PAP therapy. Emergent same-day ENT consultation was arranged by sleep providers. Posterior cordectomy was performed shortly thereafter. The patient was scheduled for an AVAPS titration study.

Conclusion: In cases with progressive neuromuscular disease, stridor may be missed during virtual appointments for a variety of reasons including technical difficulties, or the virtual medium not being sensitive enough to convey stridor. This case highlights the importance of having a high index of suspicion for stridor and impending respiratory failure requiring emergent intervention in patients with neuromuscular disease.

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1024

A CHALLENGING INSPIRE CASE: ALL ROADS DO NOT NECESSARILY LEAD TO ROME

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Introduction: Hypoglossal nerve stimulation (HNS) for the treatment of obstructive sleep apnea (OSA) in patients who have failed positive airway pressure (PAP) therapy for one reason or the other is now standard of care. Once the device is implanted and activated, voltage to stimulate the nerve has to be titrated over time, ultimately leading to an HNS titration study. There are 4 possible electrode configurations to stimulate different fibers in the nerve that can be employed for treatment. We present a case of a patient who was a challenge with worsening of OSA with Inspire.

Report of case(s): A 65-year-old woman with hypertension, and severe OSA, intolerant of positive airway pressure or oral appliances was implanted with Inspire. Post activation, there was symptomatic improvement with reduction of overall apnea-hypopnea index (AHI) from 34 per hour of sleep to 6.3 per hour. However, patient slept exclusively on the sides with evidence of significant residual disease in REM sleep. During subsequent weeks, patient reported inability to restrict position and discomfort and anxiety associated with up titration. Both awake endoscopy and advanced overnight HNS titration were pursued. All 4 electrode configurations were tested during both procedures. With the exception of (minus-plus-minus) configuration, there was worsening of sleep disordered breathing and higher residual AHI of 60 per hour on polysomnography and evidence of poor tongue motion and collapsed velopharynx on awake endoscopy. Inspire settings were readjusted to (minus-plus-minus) configuration with instructions for very slow outpatient up titration and co-management of anxiety and discomfort with anxiolytics and sleep aids.

Conclusion: We make two important conclusions from this case. Firstly, although there are established criteria for patient selection for hypoglossal nerve stimulation therapy, certain other factors that impact success which are not as easily defined include the patients' expectations, tolerance of discomfort, propensity to anxiety and personality type which impact the ability to successfully titrate voltage with the Inspire device over time. Secondly, as the tongue is a complex muscle, both under titration and over titration may be counterproductive and additionally, electrode

configuration may also have varying effects on tongue protrusion and impact success.

Support (if any):

Abstract citation ID: zsad077.1024

1025

SCHIZOPHRENIC PATIENT WITH LARGE REM REBOUND FOLLOWING TREATMENT OF SEVERE OBSTRUCTIVE SLEEP APNEA

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Introduction: We present a case of uncontrolled schizophrenia with severe obstructive sleep apnea (OSA) and significant REM rebound after bilevel positive airway pressure (BPAP) therapy.

Report of case(s): A 74-year-old female, with Schizophrenia on anti-psychotic therapy, presented to the sleep clinic due to excessive daytime sleepiness (EDS) and an Epworth score of 21/24. Diagnostic polysomnogram (PSG) reported an AHI of 162.1 events/hour with SaO₂ nadir of 71% with sleep efficiency of 31.6% and no REM-sleep, consistent with severe OSA. The next morning, multiple sleep latency testing (MSLT) demonstrated mean sleep latency (MSL) of 3.6 minutes with 0 REM-onset sleep periods (SOREMPs). Patient underwent CPAP/BPAP titration which improved sleep efficiency to 88.6% and severe REM rebound at 61.7%. MSLT after the titration study demonstrated MSL of 4.0 minutes and 3 SOREMPs and was initiated on BPAP therapy at 20/13 cmH₂O. A repeat PSG, 4 weeks later showed normalization of sleep architecture. After starting PAP therapy, the patient had a significant improvement in EDS but also energy and interest levels and denied feelings of sadness, racing or paranoid thoughts. Her social life improved and started exercising regularly and volunteering in the community. There was also improved blood pressure and blood sugar levels. She was followed up in the sleep clinic regularly and remained compliant with and benefiting from BPAP therapy and was continued on anti-psychotic therapy.

Conclusion: Untreated OSA often requires repetitive arousals to reopen the obstructed upper-airway that results in increased non-REM sleep at the expense of slow wave sleep and REM sleep. PAP therapy can cause a rebound increase in REM and SWS. OSA is under recognized in schizophrenic patients and other psychiatric disorders which results in development of significant comorbidities with greater severity of psychiatric symptoms. Elevated rates of OSA have been seen in the schizophrenic population. Treatment of OSA helps with not only physical but also psychotic symptoms. Many anti-psychotics, due to causing weight gain, may contribute to OSA. Studies also indicated that CPAP response to OSA, was as favorable in people with severe mental illness, compared to other patient groups.

Support (if any): REM rebound and CPAP compliance; B. Koo, R. Wiggins, C. Molina

Abstract citation ID: zsad077.1025

1026

SEVERE SLEEP INERTIA MANAGED WITH BUPROPION

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Introduction: Severe sleep inertia (SI) can often be managed with behavioral modifications and stimulants. This patient's sleep inertia was resistant to such therapies but had remarkable improvement with Bupropion.

Report of case(s): An 11-year-old male with a history of seizures presented with hypersomnolence, SI and difficulty arousing in the morning for 3 years. There was no reported cataplexy, with occasional hypnagogic hallucinations and sleep paralysis. Family denied witnessed apneas or snoring. He had previously undergone an adenotonsillectomy at 6 years of age for obstructive sleep apnea. When initially seen, he was not taking antiseizure medications, Epworth score was 14 and BMI was 30.5 kg/m². Polysomnogram showed an AHI of 1.5 events/hour with REM latency of 179.5 minutes. Multiple sleep latency testing showed a mean sleep latency of 4 minutes, 7 seconds with 3 SOREM periods: consistent with narcolepsy. Melatonin and methylphenidate were initially prescribed, followed by dextroamphetamine-amphetamine, but were discontinued due to worsening hypersomnolence. Armodafinil improved his overall daytime sleepiness, however, severe SI persisted intermittently in the morning and with naps to the point of EMS being called on multiple occasions. EEG and brain-MRI were normal. For suspected cataplexy, venlafaxine was tried and not beneficial. Calcium-magnesium-potassium and sodium oxybate (XW) lead to no improvement in his SI. Therefore, Methylphenidate-20mg (MP) and then Armodafinil-50mg were added before bedtime, however, his SI persisted with frequently missed school. Bedtime Bupropion 150 mg was added with an immediate response. He has not missed school or daytime activities with Bupropion.

Conclusion: Sleep inertia is typically a characteristic of idiopathic hypersomnia rather than narcolepsy and is related to the abnormal transition of sleep to wakefulness resulting in reduced alertness, impaired performance, and desire to return to sleep. Such pronounced sleep inertia is atypical and caused significant quality of life impairment in our patient. Nighttime melatonin, XW, MP, and bupropion for SI has been described in the literature¹. Our patient failed multiple treatments before bupropion which was immediately successful.

Support (if any): 1. Treatment of severe morning sleep inertia with bedtime long-acting bupropion and/or long-acting methylphenidate in a series of 4 patients. Schenck, MD¹; Golden, MD²; Millman, MD³

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1027

TITLE: HYPERSOMNOLENCE FOLLOWING RESECTION OF A CRANIOPHARYNGIOMA

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Introduction: Craniopharyngiomas are rare tumors that arise from Rathke's pouch remnants along the pituitary-hypothalamic

axis. The tumor and its treatment can lead to significant neurological and endocrinological complications including alterations in appetite, endocrine insufficiency, circadian rhythms and sleep. We report the case of a woman who developed hypersomnia following resection of a craniopharyngioma

Report of case(s): This 38-year-old female with neither significant past medical history of sleep, medical, neurological, or psychiatric disorders nor a family history of narcolepsy presented with galactorrhea and amenorrhea. Imaging showed a pituitary tumor. She underwent resection of the tumor with a tissue diagnosis of an adamantinomatous craniopharyngioma. MRI post procedure showed post-surgical changes without new lesions. Diabetes insipidus and panhypopituitarism developed for which appropriate replacement therapy was initiated. She gained approximately one hundred pounds in the weeks post-surgery. Her family described new onset snoring in supine sleeping position and witnessed apneas. She denied hypnagogic hallucinations, cataplexy, or sleep paralysis. She presented to the sleep medicine clinic a few months later for evaluation of persistent hypersomnolence.

Conclusion: The most common sleep disorders post craniopharyngioma resection are sleep-related breathing disorder, hypersomnia, and circadian rhythm disorder. Sleep and appetite are felt to be altered because of direct surgical compression, injury or vascular compromise of structures involved in the control of sleep, wakefulness, and appetite. This can produce hypothalamic dysfunction induced obesity with secondary sleep-related breathing disorder and worsening hypersomnolence. In this woman the temporal relationship between the surgery and the onset of symptoms is most suggestive of this hypothalamic injury, resulting in abnormal regulation of both appetite and sleep. Improvements in weight control and hypersomnia with use of stimulant therapy in the setting of secondary obstructive sleep apnea have been reported and in addition to standard positive airway pressure therapies give hope for the management of these complications of craniopharyngioma resection.

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1028

CONGENITAL CENTRAL HYPOVENTILATION IN A PATIENT WITH MCEP2 DUPLICATION SYNDROME

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Introduction: Congenital central hypoventilation (CCHS) is a rare disorder due to impairment of autonomic nervous system clinically defined by a significantly reduced or abolished ventilatory response to hypercapnia and hypoxemia in the absence of pulmonary, neuromuscular, or cardiac disease. There is limited knowledge on associated respiratory manifestations and sleep-disordered breathing in children with the MECP2 duplication syndrome. Although sleep-disordered breathing and nocturnal hypoventilation are currently not well recognized in these children, we present a case of a patient with MECP2 mutation and congenital hypoventilation syndrome.

Report of case(s): 24-week-old male born full-term via c-section presented with recurrent respiratory problems, laryngeal cleft, dysphagia, snoring and apneic episodes. Previous genetic work up showed chromosome 15q11.2 microdeletion. Past medical history

was significant for neonatal ICU stay for respiratory distress immediately following birth. Tonsils are 1+ on exam. PSG showed profound central sleep apnea (CAI 300/h) with average apneic episodes lasted for 7 seconds and very significant periodic breathing (88%) and mild obstructive apnea. Mild hypoxemia was also seen with SpO₂ in low 90s without any significant hypercapnia. Bradypnea with resp rate 10-20/m was seen. PHOX2B gene testing was negative. Genetic testing with SNP array showed MECP2 duplication syndrome. His development is delayed, currently at the age of 20 months, including cognitive, speech and motor function for which he is on therapy. Tracheostomy was recommended, however family preferred to continue with non-invasive ventilation while awaiting diaphragmatic pacing.

Conclusion: Respiratory manifestations in MECP2 duplication syndrome patients are common, with important impact and even a possible fatal outcome. Although sleep-disordered breathing and nocturnal hypoventilation is currently not cited as an important symptom in these children, there have been several case reports of CCHS associated with this. PSG should be considered in patients with MCEP2 duplication syndrome for timely diagnosis. Different treatment modalities (ENT surgery, CPAP and NIV) can be applied successfully to treat respiratory conditions associated with MECP2 duplication syndrome.

Support (if any):

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1029

INSPIRE CONFIDENCE IN CPAP

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Introduction: Obstructive sleep apnea (OSA) is defined as the repetitive episodes of complete or partial occlusion of the airway occurring during sleep. OSA is thought to play a role in many different diseases including anxiety, depression, excessive day time sleepiness, and GERD. Treatment of OSA can often be difficult as many patients cannot tolerate CPAP.

Report of case(s): The patient is a 76-year-old male who was diagnosed with OSA in 1991. He had undergone Uvulopalatopharyngoplasty in 1997 and maxillomandibular advancement in 1999 but continued to have snoring and witnessed apneas and excessive daytime sleepiness (EDS). A repeat PSG in 2019 showed severe sleep apnea with an AHI of 37.3. The patient had been unable to tolerate his CPAP at home due to discomfort from the pressure. He was then referred for evaluation and subsequent placement of a hypoglossal nerve stimulator known as inspire by ENT. On follow-up at the sleep clinic, the patient complained that he was still having daytime sleepiness and snoring despite compliance with INSPIRE. A home study was done to evaluate the effectiveness of INSPIRE and his AHI was found to be 46. INSPIRE was reconfigured and a repeat sleep study was done which showed similar results. A decision was made to try combination therapy with INSPIRE and CPAP at a lower pressure than previously. His original CPAP settings were 12cmH₂O and with combo therapy we were able to change this to autoPAP 7-10, which the patient tolerated well and showed good control of his sleep apnea with an AHI of 4.6.

Conclusion: For those with moderate to severe OSA, the gold standard therapy is CPAP, but not every patient can tolerate CPAP therapy. One of the reasons is the CPAP pressure being too high. In 2014 the FDA approved a new treatment option for those with moderate to severe sleep apnea with the hypoglossal

nerve stimulator. In our patient, multiple different INSPIRE configurations were attempted but he still had uncontrolled OSA and EDS. We were able to use combination therapy with INSPIRE and CPAP to adequately control his OSA without needing the high pressure that he could not tolerate previously.

Support (if any):

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1030

ALICE IN WONDERLAND: A RARE SIDE EFFECT OF MONTELUKAST.

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Introduction: Alice in wonderland syndrome (AIWS), also known as Todd's syndrome, is a neuropsychological condition that causes a set of symptoms with alteration of body image. These distortions include appearing smaller(micropsia) or larger(macropsia) or appearing to be closer or farther than they are. The exact cause of AIWS is currently unknown. Some associations include, migraine, temporal lobe epilepsy, brain tumors, psychoactive drugs or Epstein-Barr-virus. The treatment for this disease primarily aims at treating the underlying reason as to why the patient had the event.

Report of case(s): 7-year-old boy presents to sleep clinic for nighttime hallucinations. Nightly episodes described as body parts that seem abnormally large or small and people talking very fast. Events lasted 15 minutes. Patient had full recall and developed anxiety when falling asleep. Medications at presentation: vitamins, melatonin, Montelukast. Montelukast was discontinued. Referred to neurology for video EEG, which was negative for frontal lobe seizures. Due to restless sleep and snoring, sleep study and ferritin was ordered. He was found to have mild OSA with an AHI of 2.2 and a ferritin level of 28. The patient was not considered a surgical candidate for his mild OSA; therefore, watchful waiting and re-initiation of montelukast proceeded with initiation of oral iron. At sleep clinic follow up, family noted improvement of hallucinations for 2-3 months and then restart, with worsening. Upon medication review, Montelukast was the inciting factor to the presence and resolution of hallucinations.

Conclusion: In this patient the montelukast seemed to be the triggering factor of AIWS. It has been suggested that the inhibition of leukotriene receptors in the brain could be responsible for this drug reaction. No other obvious triggers, or results of work up were able to better explain his resolution once he discontinued montelukast. This just further promotes close pharmacologic vigilance in the pediatric population.

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1031

OSA MANAGEMENT WITH RME DEVICE IN PEDIATRIC PATIENT WITH GBS ON IVIG AND NON SURGICAL CANDIDATE DUE TO IMMUNOMODULATED STATUS

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Introduction: Adenotonsillectomy is considered the standard of care in pediatric populations diagnosed with OSA and adenotonsillar hypertrophy. For non-surgical and specific populations, Rapid maxillary expansion, a technique that consists in increasing the transverse diameter of the hard palate with the use of a fixed orthodontic appliance, has recently been used, with evidence of improvement of signs and symptoms of the disease, AHI normalization, and overall PSG parameters improvement.

Report of case(s): Patient with a history of Chronic inflammatory demyelinating polyradiculoneuropathy and Guillain Barre syndrome, diagnosed at 8 years of age, posterior to gastrointestinal viral infection. MRI of the lumbosacral spine showed inflammatory changes at the cauda equina, conus and epiconus consistent with GBS. She also has CIDP, first diagnosed by Electromyography. The same year she had witnessed snoring and apneic episodes and underwent a PSG which showed an AHI of 2/hr. On Physical exam, she had tonsils 2+ and was referred to an ENT specialist for tonsillectomy. A repeat PSG at the age of 9 years revealed an AHI of 1.6/hour with no central apnea/hypopnea. At that time, due to clinical worsening of her neurologic symptoms, with ataxia and lower extremity weakness, she was started on a course of IVIg therapy. Due to IVIg treatment, she was not a candidate for tonsillectomy. In view of excessive daytime sleepiness, concentration difficulties at school and not being a candidate for tonsillectomy, she was referred for Rapid Maxillary Expansion. She has had maxillary expanders since the age of 9 and is now asymptomatic and her snoring has remarkably improved. She is now in the process of being fitted with braces and her lower extremity weakness has also improved with IVIg. Complete resolution of sleep apnea symptoms after rapid maxillary expansion without tonsillectomy.

Conclusion: Although tonsillectomy has been the gold standard for the treatment of OSA in the pediatric population, patients who are not surgical candidates for tonsillectomy can undergo orthodontic treatment and benefit from the outcomes. As reported in our unique case, the patient became completely symptom-free.

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1032

MIXED SLEEP APNEA MANAGEMENT IN A PEDIATRIC PATIENT WITH ARNOLD CHIARI TYPE 1 AND SEPTO-OPTIC DYSPLASIA LEADING TO HYPOPHYSECTOMY

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Introduction: Mixed Sleep apnea and Central sleep apnea are commonly noted in a patient with Arnold Chiari Malformation and definitive treatment of Arnold Chiari Malformation is surgical decompression.

Report of case(s): The patient at the time of diagnosis of Mixed sleep apnea was 7 years old. She had already undergone

tonsillectomy and adenoidectomy at the age of 4 years. Due to continued Sleep-disordered breathing, PSG was done in 2016 which showed predominantly mixed and central events. MRI was done which revealed Chiari 1 malformation with cerebellar tonsils extending 6 mm below the foramen magnum. The patient also due to septo-optic dysplasia and hypopituitarism followed with pediatric endocrinology and was on supplementation of Desmopressin, Hydrocortisone, Levothyroxine, and Somatropin. The mother at the time of pregnancy was a substance abuser, was incarcerated and the primary care was assumed by the patient's legal guardian. The legal guardian was not interested in surgery for Arnold Chiari Malformation as she feared long-term outcomes and requested alternate treatment options. The patient underwent another split study and started on CPAP. The patient did not tolerate the CPAP and was transitioned to BiPAP. During her last clinic visit, the patient's compliance had improved and she had achieved therapeutic AHI. The patient was also counseled on the effects of GH supplementation and untreated sleep apnea and is regularly followed by Sleep Medicine and Pediatric Endocrinology. The patient after transitioning to BiPAP has responded well to treatment for Mixed sleep apnea. Despite being on GH supplementation, with careful monitoring of hormone levels by Pediatric Endocrinology and symptom control by Sleep Medicine, the patient has shown remarkable improvement.

Conclusion: Mixed and central sleep apnea secondary to Arnold Chiari Malformation responds well to surgical decompression with improvement in sleep-disordered breathing. In a pediatric patient with complicated medical history with needing stress dose steroids, not a candidate for surgery, and intolerant to CPAP, BiPAP as a treatment modality showed good control of Sleep Apnea.

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1033

THE LINK BETWEEN VISION LOSS AND SLEEP

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Introduction: Non-arteritic ischemic optic neuropathy (NAION) is the most common optic nerve disorder among patients over the age of 50. Several risk factors have been associated with NAION including systemic hypertension, diabetes mellitus, advanced age, and certain optic disc morphologies. A significant association between obstructive sleep apnea (OSA) and NAION has also been reported. Here, we present a case of a middle-aged man with a recent diagnosis of NAION who was subsequently found to have OSA.

Report of case(s): A 53-year-old man with a remote history of head injury with concussion and tobacco use was referred to the Sleep Medicine Clinic from Ophthalmology for evaluation of obstructive sleep apnea (OSA). The patient initially presented to Ophthalmology due to acute onset, painless, left-sided, inferior vision loss. The patient was otherwise healthy and denied a history of diabetes mellitus or hypertension. He did report alcohol and cigar use on the night prior to the acute onset vision loss. He denied fevers, chills, joint or jaw pain, scalp tenderness, or jaw claudication. On initial evaluation he was found to have significant left eye optic disc edema. Blood test revealed normal complete blood count (CBC), erythrocyte sedimentation rate (ESR), and C-Reactive protein (CRP). His orbit and brain

magnetic resonance imaging with and without contrast revealed no significant findings. He was subsequently diagnosed with left NAION. Further review of symptoms was positive for snoring, dry mouth, nighttime awakenings, and unrefreshing sleep, concerning for OSA and leading to referral to our Sleep Medicine Clinic. During initial consultation in Sleep Medicine, he denied symptoms concerning for any other sleep disorders. He subsequently underwent a home sleep test (WatchPAT) which confirmed the diagnosis of OSA. The apnea-hypopnea index (AHI) was 7.9 and the lowest oxygen saturation was 88%.

Conclusion: Given the reported association between NAION and OSA, a careful history should be obtained to screen for OSA when NAION is diagnosed.

Support (if any):

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1034

A RARE CASE OF ROHHAD SYNDROME

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Introduction: Early diagnosis of pediatric syndromes that are rare and involve multiple systems can be challenging. Rapid onset obesity, hypoventilation, hypothalamic dysfunction, and autonomic dysregulation characterizes ROHHAD syndrome which, if undiagnosed, can lead to potentially harmful outcomes including deferring radiological workup for a neural crest tumor (which has an over 50% association) and cardiopulmonary arrest.

Report of case(s): A 10-year-old female with a history of obesity, precocious puberty, recurrent hypothermia, recurrent sodium derangements, bilateral ptosis, seizure disorder, and GERD initially presented to sleep clinic as a 4-year-old in 2017 when she recently began snoring with excessive daytime sleepiness as a result of rapid onset of weight gain. BMI at that time was 99th percentile and Epworth was 11. An in-lab polysomnography revealed severe OSA with AHI 26.4 events/hour; nocturnal hypoxemia with TS90 27% and O2 nadir 70%; and sleep related hypoventilation based on elevated pCO₂ on end-tidal capnometry. Patient underwent adenotonsillectomy, revision adenoidectomy, and was started on CPAP before transitioning to BiPAP over the span of the next several years with serial polysomnographies ultimately showing significant improvement of sleep apnea with AHI 5.4 events/hour. Sleep-related hypoventilation, however, remained persistent with blood gases showing pCO₂ as high as 89. PHOX2B gene testing was negative and secondary causes of hypoventilation were ruled out. During this time, she was also followed by Endocrinology for suspected hypothalamic dysfunction resulting in precocious puberty, deceleration of growth rate, sodium derangements. Autonomic dysfunction was also suspected due to recurrent hypothermia including a recent admission for Temperature < 95F and ophthalmologic abnormalities including bilateral ptosis. At a multidisciplinary care conference, a working diagnosis of ROHHAD syndrome was made based on the rapid onset of obesity, hypoventilation on sleep studies and CBGs, hypothalamic dysfunction, and autonomic degeneration. Workup for neural crest tumor with MRI chest and abdomen unremarkable. Outside academic consultation was sought for management which recommended shared

decision-making regarding steroids, immunosuppressive therapy (eg rituximab, cyclophosphamide), and IVIG.

Conclusion: For ROHHAD syndrome, there are very few documented cases in the United States and there is no known laboratory marker; diagnosis remains clinical and takes multidisciplinary collaboration, education, and a high degree of suspicion.

Support (if any):

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1035

JOUBERT SYNDROME AND SEVERE CENTRAL SLEEP APNEA TREATED WITH NONINVASIVE VENTILATION: A CASE REPORT

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Introduction: Joubert syndrome is an autosomal recessive heterogeneous ciliopathy characterized by cerebellar vermis hypoplasia resulting in ataxia, hypotonia, developmental delay, neonatal respiratory dysregulation, and abnormal eye movements. It is typically accompanied by the pathognomonic “molar tooth sign” on brain MRI. Primary central sleep apnea has been described in case reports about this condition, however given the rarity of this disease, there are very few studies conducted on these patients. Our goal is to share our treatment approaches for the sleep disturbances seen in these patients.

Report of case(s): A 6-year-old female from Kuwait with a history of Joubert syndrome and global development delay presented at UCMC for evaluation of sleep issues. During the history taking, patient’s mother reported that the patient was born with acute respiratory failure shortly and required CPAP therapy in the NICU. She later developed tachypnea and cyanosis during feedings, which prompted further evaluation. A subsequent brain MRI demonstrated a molar tooth sign consistent with Joubert Syndrome. Patient required supplemental oxygenation due to nocturnal desaturations found on pulse oximetry. Due to persistent apneas and chokings during sleep, the patient underwent a repeat diagnostic polysomnogram with an electroencephalogram at our institution demonstrating severe central sleep apnea most predominant during NREM sleep. An extended montage of the EEG did not show any epileptiform discharge. This was followed by a mask de-sensitization and an inpatient PAP titration study during which BPAP therapy ST mode with a backup rate of 8 breath/minute successfully treated the patient’s primary central sleep apnea. Patient also underwent a multidisciplinary consultation with PM&R, speech therapy and ophthalmology due to her ataxia, speech delay, and need to assess for retinal dystrophy, respectively.

Conclusion: Sleep disordered breathing in the neonatal period is an early presentation in Joubert syndrome with central sleep apnea being the primary sleep disordered breathing. Fortunately, the clinical course of sleep disordered breathing does improve with treatment overtime, as in our case. Treatment options include conservative treatment, oxygen supplementation or PAP therapy. In our case, BPAP with ST mode was the most effective modality despite the need for mask desensitization and initial hesitation with using a PAP device.

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1036

TRAUMATIC COMPLICATIONS OF UNRECOGNIZED SOMNAMBULANCE IN A PEDIATRIC PATIENT

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Introduction: Parasomnias are unusual, disruptive, and abnormal verbal or motor events that occur during sleep or between wake and sleep transitions. They can occur in non-rapid eye movement (NREM) or rapid eye movement (REM) sleep stages. NREM parasomnias are typically more prevalent in pediatric populations. One such NREM parasomnia is sleep walking or somnambulism. One study estimates somnambulism has a prevalence of 17% in ages 3-13 years¹. Somnambulism typically occurs during stage 3 sleep which is clustered in the first half of sleep when REM is less prevalent

Report of case(s): A 4-year-old previously healthy male presented to clinic for a somnambulism consult. Around 6 months prior, his parents awoke around 3 AM to check on their crying infant, a sibling of our patient, and noticed the patient was missing. They noticed the back door open. Two blocks away they saw police lights and found he had been hit by a vehicle. He was admitted to the hospital for polytrauma, including bilateral pulmonary contusions with acute respiratory failure, grade 4 liver and kidney lacerations, grade 3 adrenal injury, and right parietal lobe parenchymal and subarachnoid hemorrhages. He was later discharged in stable condition with persistent but improved spasticity, impaired mobility, and cognition. His parents had not noticed any prior episodes of somnambulism. However, they did report other frequent parasomnias: somniloquy and confusional arousals. These episodes were worse following late evenings. There was a strong family history of somnambulism in the parent's siblings. They denied any sleep disordered breathing symptoms. Parents were reassured and educated about parasomnia's self-limited nature but to keep a safe environment and avoid sleep deprivation.

Conclusion: The majority of parasomnia in children have benign outcomes and eventual self-resolution with age. However, rare circumstances arise where these events can be hazardous including sleep-cooking, risking fire and burns or, as in this case, unknowingly walking into traffic. A sleep study is not always needed as parasomnias are a clinical diagnosis. However, it's important to note that if a patient has a history of parasomnias parents should be educated on the importance of keeping a safe environment to prevent possible harm.

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1037

CENTRAL SLEEP APNEA DUE TO HIGH ALTITUDE PERIODIC BREATHING

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Introduction: Many popular tourist destinations are at high-altitude. Visitors commonly report poor sleep quality during the first few nights after arriving, but some do not resolve over time and daytime symptoms may develop that require medical attention.

Report of case(s): A previously healthy 76-year-old American man presented with progressive fatigue and frequent nocturnal awakenings to a clinic in Bogota, Columbia (altitude 2640 meters), where

he had been living for eighteen months during the COVID-19 pandemic lockdown due to limited ability to travel. An arterial blood gas on room air revealed hypocapnia with a partial pressure of CO₂ of 25 mmHg. A polysomnography (PSG) performed in Bogota demonstrated an apnea-hypopnea index (AHI) of 98 events/hour consisting of predominately central as well as obstructive respiratory disturbances (Figure 1). After a titration study, he was placed on treatment with continuous positive airway pressure (CPAP) at 10 cmH₂O along with oxygen 1 L/min, but he had difficulty acclimating to treatment. The patient presented to our institution two months after returning to the USA with significantly improved symptoms despite remaining off CPAP. Repeat PSG revealed a substantial reduction in the AHI at 15 events/hour consisting of only central respiratory disturbances in the supine position during transitional N1/N2 sleep (Figure 2). Positional therapy was recommended. A repeat home sleep study performed three months later to reassess disease severity during non-supine sleep showed resolution of respiratory disturbances (Figure 3). High-altitude periodic breathing is a common phenomenon, characterized by alternating periods of absent respiratory efforts with periods of hyperventilation without another etiology (1, 2). It occurs due to the interaction of hypocapnia and increased loop-gain (2). Central sleep apnea (CSA) is considered a disorder only when associated with symptoms, not simply due to an elevated central apnea index (3). The more rapid ascent and the higher the altitude, the greater risk of developing periodic breathing. Descending to a lower altitude will often resolve apnea after few days but the phenomenon can persist for up to months (2, 4) as our patient.

Conclusion: CSA develops commonly upon ascent to high altitude. When feasible, symptomatic patients should be encouraged to descend to a lower altitude.

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1038

TREATING OBSTRUCTIVE SLEEP APNEA WITHOUT BATTING AN EYE: A CASE OF LACRIMAL DUCT AIR REGURGITATION COMPLICATING CPAP THERAPY

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Introduction: Dacryocystorhinostomy (DCR) is a surgical procedure that re-opens the nasolacrimal duct in patients with nasolacrimal duct obstruction and relieves symptoms of epiphora (watery eyes) by allowing tear drainage back to nasal mucosa. This procedure, however, can present a unique challenge for patients with obstructive sleep apnea (OSA) on continuous positive airway pressure (CPAP).

Report of case(s): We present a 65 year-old man with a history of nasolacrimal duct obstruction status-post DCR who initially presented with daytime hypersomnolence and multiple nighttime awakenings. He underwent polysomnography (PSG) demonstrating moderate OSA with Apnea-hypopnea index (AHI) 18.5 events per hour. After initiation of CPAP, he reported eye pain, dryness and a sensation of air blowing into his eye. Both mandibular advancement device and BPAP (bilevel positive airway pressure) were attempted, unfortunately neither was found to be sufficiently effective.

Conclusion: This patient experienced a potential complication of DCR called lacrimal duct air regurgitation (LADR), which occurs due to the potential for reflux of air through the relatively dilated anastomosis from nasopharynx to puncta of the eye. By reducing

end expiratory pressure, BPAP may in theory relieve expiratory LADR. A total-face mask was then employed as, covering the eyes allows for pressure equalization across the duct with resultant LADR improvement. This improved eye discomfort, but adherence was limited due to bulkiness of the mask. Lacrimal duct plugging may also be explored to reduce air reflux. This is an example of an uncommon complication of PAP therapy and highlights the unique challenges in maintaining adherence in this setting.

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1039

THE PROGRESSION OF SLEEP-RELATED BREATHING DISORDERS IN A PATIENT WITH JOUBERT SYNDROME

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Introduction: Joubert syndrome (JS) is a rare autosomal recessive disease characterized by malformations of the cerebellar vermis, hypotonia, developmental delay, and respiratory variability. Among the potential health challenges that children with congenital malformations of the central nervous system including JS, may face, sleep concerns are frequent and may include sleep-related breathing disorders (SRBDs).

Report of case(s): A 17-month-old female with JS was referred to the pediatric pulmonary clinic due to disrupted and fragmented sleep. She had frequent nocturnal awakenings, snoring, mouth breathing, and witnessed apneas. There was no family history of SRBDs. Physical exam was notable for high-arched palate, diffuse hypotonia, and intermittent periods of tachypnea followed by apneas, even when awake. Her polysomnography (PSG) demonstrated an apnea-hypopnea index (AHI) of 27.1/hour, with the obstructive apnea-hypopnea index (oAHI) of 18/hr with central apnea index (CAI) of 9.1/hr and nadir oxygen saturation (SpO₂) of 87%. An attempt was made to initiate supplemental oxygen; however, the patient did not tolerate the cannula. At that time, neither adenoid nor tonsillar hypertrophy were noted and surgical intervention was not indicated. The repeat PSG one year later demonstrated AHI of 9.1/hour, oAHI of 4.7/hr with CAI of 4.4/hr and nadir SpO₂ of 84%. At this time, she did demonstrate enlarged adenoids and tonsils and underwent adenotonsillectomy with some clinical improvement in snoring. Her mother noted continued pauses in breathing and post operative PSG demonstrated AHI of 12.8/hour, oAHI of 1.4/hr and CAI of 11.4/hr and nadir SpO₂ of 79%. The patient had demonstrated worsening episodic tachypnea and central apneas and the decision was made to attempt initiation of a respiratory assist device to regulate breathing and ventilation. Due to the patient's age, intensive therapy desensitization is required to allow her to tolerate positive airway pressure therapy.

Conclusion: Patients with JS are at high risk for complex SRBDs as part of their clinical presentation. It is therefore important to carefully monitor the character of sleep-disordered breathing, offering appropriate treatments where indicated. It is important to note the added challenges of young pediatric patients who often require deliberate desensitization interventions to proceed with successful treatment.

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1040

SLEEP HYPOVENTILATION WITH DAYTIME EUCAPNIA IN COPD MAY PREDICT HYPERCAPNIA DURING EXACERBATION

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Introduction: Patients with severe Chronic Obstructive Pulmonary Disease (COPD) are known to be at risk for nocturnal hypoventilation¹. We present a case of patient with severe COPD with near normalization of PaCO₂ levels after exacerbation but persistent nocturnal hypoventilation.

Report of case(s): 71-year-old woman with COPD Group 4D, on home oxygen, was seen in pulmonary clinic after two hospitalizations for hypercapnic respiratory failure, PcO₂ >100 mm Hg requiring acute Noninvasive ventilation (NIV) support. Three weeks after discharge, ABG improved to 7.39/49/140 on 32% Fio₂, preventing her from qualifying for long-term home NIV. Sleep study was negative for sleep apnea but showed hypoventilation during sleep. Wake supine transcutaneous CO₂ was 45-47 mmHg, increasing to 51-55 mmHg during sleep, worse with supplemental oxygen to 66-67 mm.

Conclusion: Chronic hypercapnia is a poor prognostic indicator in COPD⁴. In patients with persistent hypercapnia following COPD exacerbation, NIV prolongs time to re-admission or death within 12 months². Blunting of chemoreceptor response has been noted in hypercapnic patients³, possibly causing subsequent daytime hypercapnia and overt respiratory failure. However, nocturnal hypercapnia is present in some patients and may be a risk factor for profound, life-threatening hypercapnia during exacerbation. Future studies are needed to better phenotype patients such as ours who may be seemingly eucapnic in between exacerbations, but markedly hypercapnic during exacerbation, to determine if there is benefit in treating these patients with NIV as well.

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1041

RECURRENT RETROPHARYNGEAL GANGLIONEUROMA IN A PEDIATRIC PATIENT

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Introduction: Ganglioneuroma is a rare benign subtype of peripheral neuroblastic tumor that arises from sympathetic ganglion cells. Fewer than 10% of these cases occur in the head and neck

and are rarely seen in pediatric patients. Clinical symptoms and treatment are dependent on mass location and extension. The authors present a case of recurrent retropharyngeal ganglioneuroma in a pediatric patient.

Report of case(s): Patient is a 2-year-old previously healthy female who presented with progressive snoring and found to have retropharyngeal lymphadenopathy during tonsillectomy. Differential diagnosis included retropharyngeal abscess; however, after no improvement with antibiotics, malignancy was suspected. Pathology results from a needle biopsy confirmed the diagnosis of ganglioneuroma. CT imaging showed extension of mass to bilateral retropharyngeal, posterior mediastinal and paraspinal, and retroperitoneal spaces. Given concerns for significant morbidity with complete resection, patient underwent partial resection of mass, followed by chemotherapy to decrease tumor burden. Patient initially did well, then developed nine-month progressive snoring, positional apnea, persistent stertor, and dysphagia. Sleep study showed severe obstructive sleep apnea (OSA) with apnea hypopnea index (AHI) 74, oxygen nadir 66%, and maximum transcutaneous carbon dioxide (CO₂) level of 58 mmHg. Repeat CT imaging showed regrowth of the tumor with large right-sided retropharyngeal mass, mass effect on right oropharynx and associated vasculature, and moderate narrowing of airway. Supplemental oxygen via nasal cannula was initiated as inpatient, due to concerns that noninvasive positive pressure support would further compromise the critical airway. Urgent repeat debulking of the tumor with partial pharyngectomy was completed. Post-operatively, patient's oxygen dependence, stertor, and positional apnea resolved within 24 hours. Repeat sleep study showed considerable improvement with mild OSA, AHI 1.4, oxygen nadir 89%, and maximum transcutaneous CO₂ level of 47 mmHg. Her dysphagia and residual mild intermittent snoring are improving with no signs of recurrence of the mass.

Conclusion: Upper airway obstruction secondary to neck mass in pediatric patients is rare and even less commonly found to be recurrent ganglioneuroma. This case offers further understanding of the complexities of diagnosing and treating insidiously growing retropharyngeal tumors and the prompt management of critically obstructed airways.

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1042

COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA (CBT-I) IN PATIENT WITH NEUROLOGICAL SYMPTOMS OF UNCLEAR ETIOLOGY

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Introduction: For those experiencing neurological symptoms and being evaluated for multiple sclerosis (MS), it is important to assess whether sleep disturbance is primary or secondary to neurological disease. In this case, CBT-I was initiated to rule out a sleep disorder as an underlying cause of neurological symptoms.

Report of case(s): The patient is a 61-year-old, White, female with chronic insomnia, excessive daytime sleepiness, and mild OSA comorbid with abnormal brain MRI (significant non-specific lesions). Patient is followed by neuroimmunology for management of neurological symptoms with unclear etiology (fatigue, paresthesia, neuropathic pain, and impaired cognition). She was referred to sleep medicine by her neurologist who suspected severe fatigue and sleepiness may be contributing to complex medical presentation. Patient

endorsed a history of sleep-maintenance insomnia associated with drowsy driving (1 MVA and 3 near-misses). Of note, patient discontinued CPAP use for mild OSA in spring 2022 due to device recall. Her sleep physician recommended CBT-I to increase TST prior to OSA re-evaluation. Patient presented as anxious and distressed regarding safety while driving. She initiated CBT-I and engaged in stimulus control, cognitive restructuring, sleep diaries, relaxation, motivational interviewing, and supportive therapy. Baseline sleep diaries showed average WASO=146 minutes, SE=58%, and TST=4.1 hours. At week 7, average WASO=60 minutes, SE=86%, and TST=6.0 hours. Though no baseline measure was obtained, sleep disturbance (PROMIS Sleep T Score) was WNL (T=54) at week 7. Depression, anxiety, and pain-related disability decreased: PHQ-9 (11-moderate to 8-mild), GAD-7 (6-moderate to 4-mild), PDI (41 to 33). Measures of daytime sleepiness remained in the severe range (ESS 20 to 18), suggesting the need for OSA re-evaluation. Although sleep quality improved, patient reported new and worsening neurological symptoms including dysphagia and falls at home. CBT-I treatment is ongoing.

Conclusion: As individuals diagnosed with MS and other neurological disorders are more likely to experience insomnia than the general population, assessment of sleep disorders and evidenced-based treatments should be part of comprehensive neurological evaluation. In this case, the patient's sleep parameters improved with CBT-I, but neurological symptoms persisted and worsened, suggesting the need for continued assessment and follow-up with neurology and sleep physicians.

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1043

A RARE CASE OF NON-24-HOUR SLEEP-WAKE RHYTHM DISORDER IN A SIGHTED PATIENT

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Introduction: Non-24-hour sleep-wake disorder is a circadian rhythm sleep disorder which causes failure of endogenous circadian rhythm cycles to synchronize to a 24-hour day. Despite an unknown prevalence in sighted people, it's thought to be rare. We present a case of a sighted patient with concurrent bipolar disorder who presented with excessive sleepiness since preadolescence, and was later found to have N24SWD.

Report of case(s): A 29 year old woman with bipolar disorder presented with excessive daytime sleepiness and irregular sleep schedule since age 12. During her teenage years she often fell asleep at school, and she felt the sleepiness could be associated with psychotropic medication. As she grew up, despite her bipolar disorder was well-controlled, the daytime sleepiness persisted, which caused great challenge concentrating at work and difficulty holding a job. She denies cataplexy, hypnagogic hallucinations, sleep paralysis, or restless legs syndrome symptoms. She had no history of shift work or abnormal movements during sleep. Her bedtime advanced and cycled through a 24-hour period according to sleep diary. Her rise time maintains a consistent interval with her bedtime. Previously she had multiple sleep latency test and polysomnogram, after which she was diagnosed with idiopathic hypersomnia. She was treated with several stimulants without much improvement. She was offered

CBT-I but hasn't gone. She failed trial of a standardized schedule and found it stressful. She tried melatonin and light therapy for a short time without much of success, she was subsequently started on tasimelteon and the clinical response is to be followed.

Conclusion: N24SWD is reportedly rare in the sighted population, with a possible different mechanism from that of the blind population. Behavioral and environmental factors might contribute to the dysynchrony between a normal central circadian pacemaker and a non-24-hour sleep-wake behavioral pattern. Our patient's sleepiness persisted despite her psychiatric disorders were in remission. Altered circadian rhythms are not uncommon in patients with psychiatric disorders, and circadian rhythm dysfunction may be a trait marker of bipolar disease. Some antidepressants are also found to cause potential iatrogenic circadian rhythm sleep disorders. Psychosocial interventions that target stabilizing daily rhythms in patients with concurrent psychiatric illness can be helpful.

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1044

SPINAL MUSCULAR ATROPHY AND SLEEP: DOUBLE-TROUBLE

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Introduction: Spinal muscular atrophy (SMA) is a rare neuromuscular disorder which leads to progressive muscular weakness and respiratory impairment. Affected patients experience a variety of sleep problems including obstructive sleep apnea, nocturnal hypoventilation, and increased sleep disturbances. As of 2019, the first gene therapy was approved to treat patients with SMA under the age of 2, onasemnogene abeparvovec-xioi (Zolgensma™), with expedited approval due to findings of improved motor function and milestone achievement as well as survivability. We describe an unusual case of twins with SMA whom developed worsening obstructive sleep apnea after gene therapy.

Report of case(s): The patients are a set of 3-year-old male twins with past medical history significant for premature lung disease related to extreme prematurity at 24-weeks and SMA type 2. They were initially referred for polysomnography (PSG) at 1 year of age for evaluation of snoring and as a precaution related to their underlying diagnosis. Physical examination findings were significant for tongue atrophy with fasciculations and generalized muscular weakness which spared the face. Neither twin achieved gross motor milestones of standing or walking to that point. Both patients would receive the gene therapy infusion at 1 year, 8 months with subsequent improvement in hypotonia and ability to ambulate independently. For twin A, baseline PSG at age 1 showed mild obstructive sleep apnea (apnea-hypopnea index (AHI)= 3.24 events per hour) without any signs of hypoxemia or hypoventilation. By comparison, the patient's post-gene therapy PSG (around 1.5 years post-infusion) at age 3, showed progression to moderate obstruction (obstructive AHI of 6.03 events per hour). For twin B, baseline PSG showed moderate obstructive sleep apnea (AHI=9.09 events per hour) which progressed into the severe range (AHI= 11.90 events per hour) over the same time course.

Conclusion: Sleep-disordered breathing in SMA is a commonly diagnosed entity. While airway obstruction related to hypotonia would be an expected contributor, our case suggests that despite recovery of motor function through use of gene therapy,

clinicians should maintain a high level of suspicion for sleep problems with strong consideration for PSG due to the risk of sub-clinical progression of sleep obstruction.

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1045

RESOLUTION OF SEXSOMNIA WITH POSITIVE AIRWAY PRESSURE

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Introduction: Sexsomnia is an infrequently encountered non-rapid eye movement (NREM) arousal disorder that can overlap with obstructive sleep apnea (OSA). Treatment of underlying OSA has been reported to resolve sexsomnia episodes.

Report of case(s): A 26-year-old overweight man was referred to our Sleep Disorders Center for evaluation of possible "REM sleep behavior disorder." The patient's wife reported that he would fondle her breasts while he slept. Episodes began 6 months prior to his referral and occurred once every 1-2 months. During episodes, the patient did not get out of bed. He did not recall the events and denied dream recall. The patient had an infant at home with resultant sleep deprivation. He slept between 5-7 hours a night and stated episodes were more common with decreased total sleep time. Additionally, he reported recent increase in stressors after moving in with his in-laws. On evaluation, patient endorsed bruxism for which he wore a mouth guard. He reported history of sleepwalking in elementary school. He denied excessive daytime sleepiness, snoring, witnessed apneas, gasping arousals, morning headaches, unrefreshing sleep, insomnia, or substance use. He was advised to increase total sleep time and pursue a baseline polysomnogram to evaluate for sleep-disordered breathing. The polysomnogram demonstrated moderate OSA (apnea/hypopnea index of 17). Excessive arousals out of N3 sleep were not reported. He was initiated on auto-titrating positive airway pressure (APAP) and maintained moderate adherence for 2 months. At his follow-up visit, he reported no further episodes of nocturnal fondling after PAP initiation despite persistent sleep deprivation and home stressors.

Conclusion: This case highlights the importance of screening for sleep-disordered breathing which can coexist with NREM parasomnias such as sexsomnia. Even in patients without clear symptoms of sleep-disordered breathing, the evaluation, diagnosis, and treatment of possible OSA could decrease the frequency of sexsomnia episodes. Although this case study was mainly limited by short follow-up duration, the patient's resolution of sexsomnia in that time demonstrates the importance of treatment of concurrent sleep-related breathing disorders.

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1046

SEVERE HYPOVENTILATION IN A CHILD WITH RAPID ONSET WEIGHT GAIN

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Introduction: Pediatric sleep-related hypoventilation is a clinical pattern in which ventilatory insufficiency occurs in the setting

of either severe OSA (obstructive hypoventilation) or obesity hypoventilation (sleep related hypoventilation). We are reporting a case describing the management of overlapping obstructive hypoventilation due to uncontrolled severe OSA and pediatric obesity hypoventilation syndrome.

Report of case(s): The patient is a full term African American 5 y/o male with past medical history of obesity and prediabetes who was referred to discuss sleep related problems after rapid onset of weight gain. He gained 76 lbs over 8-month period; during this time his aunt noticed apneic events with the development of loud snoring. Initial workup was negative for abnormal findings, MRI w/w/o was unremarkable and TSH, cortisol, GH, IGF-1 and prolactin were all within normal limits. X-ray bone age study showed skeletal age appropriate for patient's chronologic age. Upper airway exam showed severe tonsillar hypertrophy 3+ with Mallampati class 4. The diagnostic PSG demonstrated the presence of 12 obstructive, 151 central, and 61 mixed apneas. There were 214 hypopneas resulting in an Apnea/Hypopnea Index of 60.5 events per hour. Mean oxygen saturation was 91.3%. The lowest oxygen saturation during sleep was 64.0%. Time spent $\leq$ 88%

oxygen saturation was 119.7 minutes (26.2%). End tidal CO₂ range was between 50-100 mmHg for 30% of study. The titration study revealed that the optimal treatment modality was BiPAP ST.

Conclusion: This case focuses on a five-year-old male who experienced rapid onset weight gain and presented with snoring, excessive daytime sleepiness and apneic events and was found to have profound hypoventilation with hypopnea predominant severe obstructive sleep apnea. The initial differential diagnosis of pediatric sleep-related hypoventilation includes ROHHAD, congenital central hypoventilation syndrome, primary central sleep apnea and obesity hypoventilation syndrome. The most common cause of hypoventilation during sleep in children remains OSA. The stepwise approach to management in such a case includes tonsillectomy with adenoidectomy, along with use of BiPAP. After the T&A the patient should have repeat PSG with capnography, if hypercarbia persists on post procedure PSG, he will need to continue BiPAP therapy with appropriate weight loss program. Early recognition evaluation, and treatment of obstructive sleep apnea in the pediatric population is imperative to prevent long-term consequences.

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Di Marco, Tobias	.0384, 0406	Dunn, Julia	.0567, 0572
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Diaz, Jose	.0071	Dunnewald, Maja	.0777, 0781, 0791
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Dickens, Harrison	.0640, 0651	Duthely, Lunthita	.0962
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Dickstein, Daniel	.0182, 0218, 0226, 0227, 0238	Duval, Félix Gabriel	.0009, 0172
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Donovan, Lucas	.0936	Eisner, Lauren	.0916
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Dooley, Erin	.0748	Ekin, Sarila	.0201
Doom, Jenalee	.0121	El Hage Chehade, Nabile	.0879
Doria, Sandra	.0041	El Labban, Mohamad	.0844, 0869, 0880
Dorrestein, Pieter C.	.0201	El-Ali, Mazen	.0937
Dorrian, Jill	.0005, 0015	Elammari, Mohamed	.0357
Dorsch, Jennifer	.0995	Eldridge-Smith, E. Devon	.0330, 0331, 0741
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Doty, Tracy Jill	.0062, 0161, 0170, 0178	Elkind, Mitchell	.0911
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Douglas, Megan E.	.0629, 0674	Elliott, Jonathan	.0267, 0888
Doyle, Margaret	.0841, 0842, 0846	Ellis, Jason	.0319, 0328
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Hart, Thomas	.0136, 0145, 0158	Hildebrand, Lindsey	.0063, 0066, 0080, 0186, 0305, 0332, 0403, 0416, 0639, 0649, 0684
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McCartney, Danielle	.0346	Mickelson, Samuel	.0453
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McCauley, Peter	.0190	Mignot, Emmanuel	.0574, 0701, 1017
McConnell, Andrew	.0536	Mihara, Takenao	.0562, 0604
McConnell, Will	.0460	Mikutta, Christian	.0059
McCormack, Mark	.0533	Miles, Shannon	.0666
McCrae, Christina	.0020, 0054, 0079, 0122, 0340, 0363, 0721, 0729, 0731	Millinovich, Alex	.0820
McCubbins, Hunter	.0202	Miller, Anthony	.0168
McCuiag Edge, Heather	.0212	Miller, Cameron	.0620
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McDiarmid, Melissa	.0875	Miller, Jerod	.0441, 0485
McGeary, John	.0127, 0166, 0262	Miller, Kaleigh	.0286, 0292
McGee, Ryann	.0123, 0125	Miller, Katherine	.0156, 0298, 0413, 0670
McGeoch, Ellen	.0681	Miller, Laura	.1012
McGlinchey, Eleanor	.0247	Miller, Mitchell	.0453
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McKane, Scott	.0430	Miner, Brienne	.0726, 0733
McKeown, Jason	.0394, 0396	Mintz, Sylvan	.0167
McKinstry, Robert	.0765	Miramontes Valdes, Estefania	.0754
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McMahon, Bridget	.0908	Mirchandani, Kirti	.0387
McQuillan, Maureen	.0746, 0753	Mirza, Mariam	.1013
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Meira E. Cruz, Miguel	.0289, 0472, 0832, 0946	Mithani, Sara	.0734
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Meskill, Sarah	.0511, 0586	Monceaux, Brittany	.0986, 1046
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		Moore, Bruce	.0938

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Moore, Jesse	.0615, 0675, 0856, 0858	Myers, Annika	.0152, 0159, 0231
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Moore, Raquel	.0202	Mysliwiec, Vincent	.0657, 0658, 0734
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Moore, Steve	.0816	Nadeau, Kristen	.0756, 0757, 0770
Moore, Sasha	.0878	Nadif, Rachel	.0762
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		Nishino, Seiji	.0311
		Nixon, Gillian	.0806

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O'Brien, Louise	.0462, 0773, 0809	Paixão, Carla	.0289
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Olsen, Maren	.0336	Parekh, Ankit	0055, 0095, 0308, 0435, 0468, 0537, 0543, 0723, 0739, 0885, 0887
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Onen, Hakki	.0854	Park, Chul-Seung	.0024
Ong, Jason	.0317, 0340, 0370, 0605	Park, Elena	.0385
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Patterson, Matthew	.0955	Pilla, Scott	.0001
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		Postol, Kevin	.0563

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