SLEEP 2025

Late-Breaking Abstract - Orals (CME)

LBA 1578

Brain Health from Sleep EEG: A Multi-Cohort, Deep Learning Biomarker for Cognition, Disease, and Mortality

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Introduction: Sleep correlates with cognitive decline and chronic diseases, yet transforming these associations into robust predictive models that serve as indicators of brain health is largely unexplored. We hypothesized that analyzing full-night EEG with advanced deep learning (DL) could reveal a shared “latent brain-health” representation that simultaneously predicts cognition, disease status, and mortality risk.
Methods: We collected data from seven cohorts (MGH-COG, MGH-MMSE, MESA, MrOS, FHS, SOF, KoGES) through January 2025, encompassing 6088 participants (ages 21-91), providing neuropsychological tests, disease diagnoses (e.g., dementia, depression, diabetes), and up to 11 hours of single-channel EEG recordings.

We developed a Transformer U-Net–style model that processes the entire overnight EEG as input. The encoder extracts high-level time–frequency features and produces a compressed bottleneck, enabling multi-task learning: (1) cognition regression across multiple domains (e.g., fluid, crystallized, executive functioning), (2) disease classification,

and (3) sleep staging. We benchmarked this DL approach against baseline demographic models.

Results: Our best single-cohort test correlations for total cognition reached R=0.60 in MGH-COG, surpassing the demographic-based R=0.33 ($p<0.001$). Corresponding gains were observed in other cohorts, e.g., MESA total cognition improved from R=0.30 to R=0.39 and MrOS from R=0.32 to R=0.38 ($p<0.001$). Disease classification improved from baseline AUC=0.50–0.53 to AUC=0.64–0.73. The learned brain-health latent space further differentiated subgroups by age, disease status, and cognition-level. Finally, we investigated mortality, finding that in MrOS the latent score outperformed (hazard ratio 0.72) known biomarkers like REM% (hazard ratio 0.90, $p<0.001$) or spindle density (hazard ratio 0.90, $p<0.001$).

Conclusions: Our findings demonstrate that deep-learning–derived EEG signatures can capture clinically meaningful variation in cognition and disease status across heterogeneous cohorts. Notably, the model's integrated latent space provides more robust and generalizable predictions than single features or standard demographics alone. This is the first study to show that a single architecture trained on multi-cohort, full-night EEG data simultaneously infers cognition, classifies diseases, and forecasts mortality. These results highlight the potential of advanced sleep EEG analytics to offer actionable insights into brain health, thereby facilitating more precise prognostics and targeted interventions to promote healthy cognitive aging and reduce disease burden.

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LBA 1549

Modern Times: Longitudinal Study of Rural Toba/Qom Communities Reveals Delays and Shortening of Sleep in Real Time Across Electrification

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Introduction: The light bulb revolutionized human life providing a safe, well-lit environment at night, allowing the extension of waking hours previously reserved for sleep. Studies have suggested that people in the industrialized world have lost over an hour of sleep in the last century. Moreover, research on pre-industrial communities has provided insights into sleep patterns before the industrial revolution. To better understand this phenomenon, our group has focused on native Toba/Qom communities in northern Argentina, who live under very limited conditions with varying degrees of access to electricity and other urban features.

Methods: We have recorded these communities' sleep at different points through wrist-actigraphy between October 2012 and December 2024, a span during which rural communities experienced the introduction of electricity. In this work, we built linear models including random effects out of a dataset of over 12 thousand sleep events recorded over the course of 12 years, analyzing the dynamics of sleep variables across time.

Results: We found a striking reduction in sleep duration in rural communities of around a full hour in both the summer and winter. We also detected a significant delay in sleep timing (of between ~75 and ~92 minutes), as well as a reduction in sleep regularity (of at least 7 points in the Sleep Regularity Index) in both communities.

Conclusion: The shortening and delay of sleep in the rural Toba/Qom across the introduction of electricity mimic the changes observed in modern societies through the last century, but in a mere 10-year span. The fact that the urban group has also shifted likely reflects the impact of other features that correlate but extend beyond the electric power (e.g., internet, smartphones). This is the first longitudinal study of the evolution of sleep timing in real-life conditions in a pre-industrial community, highlighting the profound impact of modern technology on sleep patterns, and should help continue to understand how technological advancements continue to shape human behavior and health.

Support: NIH Grant R01HL162311; CONICET (Argentina)

LBA 1550

Sleep Regularization Decreases Blood Pressure in People with Hypertension: A Preliminary Analysis

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Introduction: Sleep irregularity is positively associated with elevated blood pressure (BP). However, whether regularizing sleep improves BP is unknown, especially in people with hypertension. We hypothesized that an intervention involving two weeks of sleep regularization would decrease BP in people with hypertension.

Methods: Nine people with hypertension (4 males/5 females [53 ±SD6 y]) were studied. Initially, we measured ambulatory BP and assessed sleep using actigraphy over a baseline week (no restrictions on sleep-wake times). Afterward, participants were instructed to regularize bedtime for two weeks by going to bed at the same time every night before reassessing their ambulatory BP. Sleep duration was not controlled. Average daytime and nighttime sleep were determined based on participants' sleep diaries and actigraphy. The standard deviations of bedtimes and sleep durations were used to measure their variability. T-tests were performed to compare baseline versus sleep regularization periods with significance set as $p<0.05$. The minimal detectable change (MDC) was calculated from ambulatory BP monitoring collected during the eligibility screening to analyze individual responses. Data cleaning and statistical analysis were conducted between March 12-17th, 2025.

Results: As planned, bedtime variability decreased after sleep regularization compared to baseline (29±18 vs. 7±10 minutes, p=0.01); while sleep duration and sleep variability did not change. 24-hour systolic BP (128±15 vs. 123±12 mmHg, p=0.04) and 24-hour diastolic BP (80±6 vs. 76±5 mmHg, p=0.04), as well as daytime diastolic BP (87±6 vs. 82±5 mmHg, p=0.03), were significantly lower after sleep regularization compared to baseline. Individual analysis revealed that 63% and 75% of participants decreased 24-hour systolic and diastolic BPs greater than the MDC cut-off. Reductions in daytime systolic BP (135±12 vs. 129±13 mmHg, p=0.07), nighttime systolic BP (120±17 vs. 115±14 mmHg, p=0.07), and nighttime diastolic BP (74±9 vs. 70±7 mmHg, p=0.07) did not achieve statistical significance.

Conclusion: In people with hypertension, two weeks of sleep regularization decreases 24-hour ambulatory BP. BP reduction overcoming measurement error calculated from MDC in ~70% of the participants suggests sleep regularization as an adjunctive strategy to control BP in hypertension, which needs to be tested in a randomized controlled trial in the future.

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LBA 1551

Predictors of Sleep-Wake Fragmentation in Hispanic Individuals with Type 2 Diabetes: Insights from the HCHS/SOL Study

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Introduction: Despite its prevalence, the causes of disruption to consolidated sleep and wake are poorly understood, especially in non-Caucasian populations. Furthermore, risk factors in these populations may lead to unique vulnerabilities that could further compound 24-hour patterns of sleep-wake fragmentation (SWF). In Hispanic individuals in the United States, type 2 diabetes mellitus (DM) may represent one such factor. DM is more common in Hispanic individuals (+17%) and inadequate sleep duration has been linked to DM. To determine whether diabetes plays a role in SWF among a Hispanic population, we analyzed the Hispanic Community Health Study/Study of Latinos (HCHS/SOL).

Methods: Data from the HCHS/SOL (n=1576) were obtained through the National Sleep Research Resource. Participants underwent one week of accelerometry monitoring. Missing data were identified and imputed prior to performing non-parametric analyses. The primary output measure of SWF was Intradaily Variation (IV). Other sleep parameters include Intradaily Stability (IS), amount of least (L5) and most (M10) activity, and relative amplitude (RA) of the rest-activity rhythm. Machine learning models, including Random Forest and XGBoost, were used to investigate patterns and contributors of SWF.

Results: Measures of sleep fragmentation (IV) and other measures of sleep (IS, L5, M10, RA) did not differ among individuals with diabetes (n=257) and age-gender-matched non-diabetic controls (1:1 matching) (p's>0.05). In the full dataset, machine learning models conducted on 03/15/2025 explained 87% of the total variance in SWF. Key predictors included the degree of activity during the 10 most active hours (M10, 5.2%), IS (3.6%), work hours per day (2.6%), and white light exposure 4 hours after habitual sleep offset (2.2%). Diabetes status was not a significant predictor of sleep-wake fragmentation in none of the ML models.

Conclusion: In a sample of Hispanic individuals, diabetes status was not identified as a primary predictor of SWF. In contrast, similar to our previous findings in an older, Caucasian population, light exposure 4 hours after sleep offset emerged as the strongest predictor, potentially reflecting an effect of light on circadian amplitude. Further investigation is needed to confirm this hypothesis.

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Late Breaking Abstract – Orals (Non-CME)

LBA 1645

Nocturnal Spontaneous Arousals in People With Narcolepsy and Idiopathic Hypersomnia Treated With Low-Sodium Oxybate

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Introduction: Disrupted nighttime sleep in narcolepsy and nonrestorative nighttime sleep in idiopathic hypersomnia may include increased arousals from sleep. This analysis evaluated effects of low-sodium oxybate (LXB, Xywav®) on polysomnography (PSG)-measured arousals in participants with narcolepsy (type 1 [NT1]/2 [NT2]) or idiopathic hypersomnia.

Methods: Jazz DUET (Develop hypersomnia Understanding by Evaluating low-sodium oxybate Treatment), a phase 4, prospective, multicenter, single-arm, multiple-cohort, open-label study (NCT05875974), included screening (2-week washout for oxybate current users), 8-day baseline (BL), ~5–12 week intervention (titration + stable dose + end of treatment [EOT]), and 2-week safety follow-up periods. Participants underwent nocturnal PSG at BL and EOT. PSGs were ad libitum (allowing ≥10 hours in bed). Use of sleep-disordered breathing therapy was permitted. Exclusion criteria included baseline PSG apnea-hypopnea index (AHI) >10. Arousals were defined per AASM scoring criteria. Data were analyzed for the completer set (took LXB regimen for ≥1 night and completed EOT). Reported results were obtained on 12/18/2024.

Results: Enrolled participants who took LXB included 55 with narcolepsy (72.7% female; 80.0% White; mean±SD: age, 33.4±12.9 years; body mass index [BMI], 29.5±6.7; 13 participants transferred to another study cohort) and 46 with idiopathic hypersomnia (80.4% female; 84.8% White; age, 38.1±11.8 years; BMI, 28.5±6.4); completers included 34 with narcolepsy (NT1, n=16 [47.1%]; NT2, n=18 [52.9%] and 40 with idiopathic hypersomnia. Narcolepsy and idiopathic hypersomnia mean±SD BL/EOT arousal index (events/hour during total sleep time) were 13.8±7.5/10.4±6.4 (LSM change [95% CI], –3.4 [–5.2, –1.7]; P=0.0004) and 14.3±6.9/10.5±6.9 (LSM change [95% CI], –3.8 [–5.7, –1.9]; P=0.0003); BL/EOT number of spontaneous arousals were 85.1±41.9/68.3±42.4 (LSM change [95% CI], –16.8 [–29.9, –3.7]; P=0.0133) and 99.8±52.6/62.0±36.1 (LSM change [95% CI], –37.9 [–47.9, –27.8]; P<0.0001). Number of respiratory-related arousals (ie, those associated with hypopneas/apneas) were 3.1±5.1/2.9±6.0 (LSM change [95% CI], –0.2 [–2.2, 1.9]; P=0.8618) and 3.8±7.2/4.0±9.6 (LSM change [95% CI], 0.1 [–2.1, 2.3]; P=0.9085), respectively; BL/EOT AHI were 1.9±3.0/1.8±2.5 and 1.4±2.1/2.0±2.8, respectively.

Conclusions: Participants with narcolepsy or idiopathic hypersomnia experienced fewer PSG-based spontaneous arousals with LXB treatment versus BL, suggesting LXB improves measures of sleep fragmentation in narcolepsy and idiopathic hypersomnia. No worsening of AHI was observed.

Support: Jazz Pharmaceuticals.

LBA 1646

Prevalence and Severity of Sleep Inertia Among Individuals with Idiopathic Hypersomnia

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Introduction: Sleep inertia (SI) is a frequent, disabling, yet understudied symptom of idiopathic hypersomnia (IH), a sleep disorder that affects many aspects of daily life. The objective of this study was to describe the self-reported prevalence, severity, and impact of SI among individuals diagnosed with IH.

Methods: Commercially insured individuals diagnosed with IH were identified using Optum Research Database administrative claims (1/1/2019–5/31/2024). Eligible participants (n=1292) were mailed a survey including validated assessments (Sleep Inertia Questionnaire [SIQ; range of 21–105], Idiopathic Hypersomnia Severity Scale [IHSS; range of 0–50]) and de novo questions related to SI and its impact on aspects of daily life. SI was defined as an SIQ score of ≥42. Descriptive analyses were conducted; analysis and interpretation were completed in January 2025.

Results: Eligible surveys were returned by 242 participants (18.9% response rate). At survey completion, participants had a mean (SD) age of 42 (13.1) years; the majority were female (79%), worked full- or part-time (85%), and were overweight/obese (67%).

The majority of participants (72%) reported having both polysomnography and multiple sleep latency tests to diagnose their IH, and participants reported a mean (SD) time of 8.7 (7.4) years since diagnosis. Most participants (74%) reported taking prescription medication to treat IH. Mean (SD) IHSS score was 29.5 (9.5), with 69% reporting severe or very severe IH symptoms. Average sleep duration ≥11 hours/day was reported by 17% of participants. Prevalence of SI was 91%; mean (SD) SIQ score was 69.0 (18.8), indicating moderate SI; mean (SD) SI duration was 38.3 (33.9) minutes. Over half of participants reported moderate-to-high impact of SI on multiple aspects of daily life, including the ability to concentrate (69%), school or work performance (63%), and overall health (61%).

Conclusion: Participants with IH in this study report a high prevalence and severity of SI, impacting multiple aspects of daily life, highlighting the need to consider SI when choosing IH pharmacotherapy and to assess the impact of SI when monitoring therapy effectiveness.

Support: Jazz Pharmaceuticals.

LBA 1647

Impact of Switching from High- to Low-Sodium Oxybate on Ambulatory Blood Pressure in Patients with Narcolepsy

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Introduction: Patients with narcolepsy (PwN) have an increased incidence of hypertension and cardiovascular disease (CVD) risk. Excess sodium intake is strongly associated with hypertension and CVD.

Methods: XYLO, an open-label, single-arm study (NCT05869773), evaluated PwN aged 18–70 years with screening systolic blood pressure (SBP) 130–155 mmHg taking twice-nightly high-sodium oxybate (SXB; Xyrem®) 6–9 g for ≥6 weeks, switching to low-sodium oxybate (LXB; Xywav®; same dosage/regimen) for ≈6 weeks. The primary endpoint was change in 24-hour mean ambulatory SBP from baseline to end-of-treatment (EOT). Secondary endpoints were changes in daytime, office, and nighttime mean SBP. Exploratory endpoints included changes in 24-hour, daytime, office, and nighttime mean diastolic blood pressure (DBP). An interim analysis using prespecified stopping criteria (75% completers) was performed. One-sided multiplicity-adjusted P-values ("*" denotes statistical significance) for SBP least squares mean (95% CI) changes adjusted for baseline values, and two-sided nominal P-values for corresponding DBP changes, are reported.

Results: Forty-three PwN (mean age, 45 years; 65% female; stable antihypertensives, 33%; data cutoff: 16Dec2024) were evaluated. Mean (SD) baseline office SBP and DBP were 138.0 (5.7) and 85.2 (6.6) mmHg, respectively. Mean (SD) total SXB and LXB dosages were 8.0 (1.1) and 8.1 (1.1) g/night, respectively, representing 1456 (206) and 117 (16) mg sodium (difference: ≈1339 mg sodium); mean (SD) 24-hour urinary sodium was 4696.6 (2831.8) mg/day at baseline and 2934.8 (1401.4) mg/day at EOT. Mean (SD) 24-hour baseline and EOT SBPs were 132.3 (11.6) and 128.2 (12.0) mmHg, respectively; change was −4.1 (−6.9, −1.4; P=0.0019*) mmHg, meeting prespecified study stopping criteria. Changes in mean daytime and nighttime ambulatory SBP were −5.1 (−7.8, −2.4; P=0.0003*) and −2.0 (−5.3, 1.4; P=0.1265) mmHg, respectively; office SBP change was −9.2 (−11.9, −6.5; P<0.0001*). Change in mean 24-hour DBP was −2.3 (−4.1, −0.5; P=0.0118); daytime and nighttime DBP changes were −2.4 (−4.4, −0.4; P=0.0179) and 0.1 (−2.6, 2.8; P=0.9362); office DBP change

was −3.8 (−6.0, −1.6; P=0.0014). Treatment-emergent adverse events (all mild/moderate) occurred in 33% of participants.

Conclusions: Switching from SXB to LXB reduced daily treatment-related sodium intake in PwN and was associated with clinically meaningful BP reductions, consistent with evidence on dietary sodium effects.

Support: Jazz Pharmaceuticals.

LBA 1648

Effectiveness and Safety of Low-Sodium Oxybate Dosages Greater Than 9 Grams in Study Participants With Narcolepsy

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Introduction: Jazz DUET (Develop hypersomnia Understanding by Evaluating low-sodium oxybate Treatment) is a phase 4, prospective, multicenter, single-arm, multiple-cohort, open-label study (NCT05875974) evaluating effectiveness and safety of low-sodium oxybate (LXB; Xywav®) in participants with narcolepsy (type 1 [NT1]; type 2 [NT2]) or idiopathic hypersomnia. The approved, maximum recommended total dosage of LXB for adults with narcolepsy is 9 g/night. This intermediate analysis evaluates effectiveness and safety of LXB in a cohort of participants with narcolepsy taking dosages >9 g/night.

Methods: The DUET >9-g cohort followed these study periods: screening, 8-day baseline (BL) on LXB 9 g/night, 2–8-week titration, 2-week stable-dose, 8-day end-of-treatment (EOT) on an optimized total dosage between >9–12 g, and 2-week safety follow-up. Endpoints included changes in Epworth Sleepiness Scale (ESS) score and Narcolepsy Severity Scale (NSS) score from BL to EOT. Safety was evaluated by treatment-emergent adverse events (TEAEs), Columbia-Suicide Severity Rating Scale (C-SSRS), and sleep-related respiratory assessments (including apnea-hypopnea index [AHI] and mean oxygen saturation [SpO2]). Exclusion criteria included a BL AHI >10.

Results: As of 12/18/2024, 24 participants took LXB in the >9-g cohort (mean [SD] age: 38.9 [11.0] years; 62.5% female; mean [SD] body mass index: 32.7 [9.0]; 29.2% with comorbid obstructive sleep apnea; 75.0% taking concomitant alerting agents). Mean (SD) total LXB dosage during the stable-dose period was 11.2 (1.1) g/night. For completers (n=23), mean (SD) BL/EOT ESS scores were 12.1 (4.9)/9.8 (6.1); least-squares mean (SE) change from BL to EOT was −2.3 (0.6). NT1 mean (SD) BL (n=12)/EOT (n=14) NSS scores were 18.8 (14.1)/14.9 (13.2). NT2 mean (SD) BL (n=9)/EOT (n=9) NSS scores were 10.0 (4.4)/3.3 (3.7). Common TEAEs (mostly mild/moderate) included vomiting (16.7%), enuresis (12.5%), and headache (12.5%). For completers (n=23), mean (SD) BL/EOT AHI scores were 2.2 (3.2)/1.4 (1.2). Mean (SD) BL/EOT SpO2 levels were 96.0 (1.7)/95.9 (0.90); no participants had AHI >10 during the EOT PSG. No suicidal ideation/behaviors were reported on the C-SSRS.

Conclusion: This intermediate analysis demonstrates improvements in daytime sleepiness in participants with narcolepsy taking LXB dosages >9 g/night. TEAEs align with the known safety profile of LXB at lower dosages, supporting individualized clinical decision-making.

Support: Jazz Pharmaceuticals.

Late Breaking Abstract – Posters

LBA 1552
Age-Related Macular Degeneration and Circadian Preference

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Introduction: Age-related macular degeneration (AMD) is the leading cause of blindness in developed nations. Within the retina, a subset of cells, called *melanopsin-containing intrinsically photosensitive retinal ganglion cells*, are implicated in circadian rhythms, prompting a search for a potential connection between circadian behavior and AMD. Our objective was to compare the chronotype (ie, preference for morning or evening activity) of individuals with AMD to that of those without ocular conditions.

Methods: The Horne-Östberg Morningness-Eveningness questionnaire was administered to previously screened patients with wet AMD who received bilateral anti–vascular endothelial growth factor eye injections (study participants) as well as those without eye pathology (controls). Thirty-one study participants and 19 controls completed the survey and were included in the analysis. We used Wilcoxon rank sum test and Fisher exact test for continuous and categorical variables respectively.

Results: Study participants had a higher median age compared to controls (83 vs 75, $P<.001$). No significant difference in body mass index was observed between respondents. While the disparity in survey responses between study participants and controls was generally not statistically significant, more study participants struggled with attending exercises between 7:00 and 8:00 in the morning compared to controls (45% vs 21%, $P=.02$). Additionally, fewer study participants expressed the need to sleep before 10:15 PM compared to controls (55% vs 63%, $P=.04$). Study participants tended to have a delayed sleep-wake cycle.

Conclusion: In this pilot study, study participants encountered greater challenges with morning exercise compared to controls. Additionally, a lower percentage of study participants felt the need to go to sleep before 10:15 pm compared to controls. These indicators are typical of individuals with a late-night bedtime preference. Nonetheless, there was no significant difference in chronotype between study participants and controls. Despite the uncertainties, understanding the potential link between circadian rhythm disturbances and AMD could have important clinical implications. This study could serve as a foundation for more extensive research exploring the interplay between vision loss and circadian rhythms.

Support: None

LBA 1553

The Impact of Transcranial Direct Current Stimulation on Sleep Quality in Patients with Obsessive-Compulsive Disorder: The Role of Electric Field Intensity and EEG Microstates

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Introduction: Obsessive-compulsive disorder (OCD) is characterized by intrusive thoughts and repetitive behaviors, with a prevalence of 2-3%. Sleep disturbances are common in OCD and can impact symptom severity and treatment outcomes. High-definition transcranial direct current stimulation (HD-tDCS) is a promising treatment for both OCD and sleep disturbances, although its efficacy remains uncertain. This study was to investigate the effects of transcranial direct current stimulation (tDCS) on obsessive-compulsive symptoms and sleep quality in patients with OCD, focusing on the relationship between electric field intensity and EEG microstates.

Methods: Forty-four drug-naïve OCD patients participated in a randomized controlled trial, with 34 undergoing MRI and EEG data collection. Participants were randomly assigned to active (n = 18) or sham (n = 16) HD-tDCS groups. HD-tDCS sessions targeted the orbitofrontal cortex, with 10 sessions administered over two weeks. Obsessive-compulsive symptoms and sleep quality were assessed using the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) and Pittsburgh Sleep Quality Index (PSQI) before and after treatment. The electric field (EF) strength modeling was used to quantify the intensity of electrical stimulation, and EEG microstate analysis was used to examine brain activity. We explored the relationship between these two factors and clinical outcomes.

Results: There was no significant interaction between treatment and time for Y-BOCS and PSQI scores. The EF intensity was not related to improvements in OCD symptoms. However, in the active group, EF intensity in the right frontal cortex regions was significantly correlated with PSQI reduction, while no such correlation was found in the sham group. EEG microstates showed stable topologies across groups, with significant correlations between EF strength in the right orbitofrontal gyrus and changes in microstate A duration and PSQI scores.

Conclusion: tDCS appears to be an effective intervention for improving sleep quality in OCD patients, with electric field intensity and EEG microstates playing crucial roles. These findings support the potential for tDCS to be used as a non-invasive treatment option for sleep disturbances in OCD, paving the way for further research and clinical application.

LBA 1554

Fluctuations of Resting-State Functional Brain Magnetic Resonance Imaging in Taiwanese Patients with Obstructive Sleep Apnea

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Introduction: Obstructive sleep apnea (OSA) significantly impacts cognitive function, awareness, and sensorimotor processing. Resting-state functional magnetic resonance imaging (rs-fMRI) has provided insights into the neural disruptions associated with OSA, yet research has largely focused on connectivity analyses. This study investigates the correlation between the apnea-hypopnea index (AHI), Epworth Sleepiness Scale (ESS), Montreal Cognitive Assessment (MoCA) scores, and the fractional amplitude of low-frequency fluctuations (fALFF) in patients with OSA.

Methods: This retrospective cohort study was conducted from January 2025 to February 2025 at a tertiary medical center in Taiwan, including 67 patients with OSA who underwent brain rs-fMRI between September 2021 and January 2025. fALFF was computed using rs-fMRI data and analyzed with tract-based spatial statistics. Voxel-wise regression analyses were performed against AHI, ESS, and MoCA scores using statistical parametric mapping, adjusting for age and gender (significance threshold: $p < 0.001$).

Results: The cohort included 61 men (91%) and 6 women (9%), with a mean age of 38.7 ± 9.3 years, a mean AHI of 42.40 ± 28.66 events/h, a mean ESS of 10.0 ± 4.2, and a mean MCoA score of 27.1 ± 4.2. Significant correlations were identified between: AHI and fALFF in the right middle temporal gyrus, involved in cognitive processing, facial recognition, audiovisual emotion perception, and reading comprehension; ESS and fALFF in the left posterior cingulate gyrus, associated with awareness, pain perception, episodic memory retrieval, and working memory performance; MoCA score and fALFF in the cerebellum, linked to sensorimotor control, vestibular function, cognition, emotion, and autonomic regulation (T values: 4.05 to 5.24, all $p < 0.001$).

Conclusion: OSA severity is strongly correlated with alterations in rs-fMRI biomarkers in brain regions critical for cognition, awareness, working memory, sensorimotor function, emotion, and autonomic control. These findings enhance our understanding of the neuropathological mechanisms of OSA and suggest potential functional biomarkers for disease severity and management.

LBA 1555

Lunar Gravity Predicts Human Sleep Patterns Under Post-Industrial and Rural Conditions

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Introduction: We previously established an association between moon phases and sleep timing in Toba/Qom communities (Argentina) with limited electric lighting, where sleep onset is delayed, and duration is reduced in the days before the full moon. Surprisingly, similar patterns were observed in college students from Seattle, a highly urbanized environment. Here, we longitudinally recorded and analyzed sleep in both populations to better understand the factors driving lunar rhythmicity in sleep patterns.

Methods: Participants from Toba/Qom communities (n=175) and Seattle (n=123) wore actigraphy watches and completed sleep diaries for 24–60 days. Data were collected across multiple cohorts (2016–2024 for Toba/Qom, 2020–2025 for Seattle). Daily moon phase data were derived,' and hourly gravitational effects of the moon and sun were obtained in early 2025.

We analyzed the association between sleep onset and duration with the synodic lunar (30-day) and semilunar (15-day) cycles at the population and cohort levels using GLMMcosinor models, adjusting for 'type of day' (weekday/weekend), 'cohort,' and 'id' (random factor). At the individual level, we used non-linear models to fit sinusoidal patterns (30-day alone or combined with 15-day). We also modeled gravitational pull effects over the study period.

Results: Sleep onset and duration followed an approximately 30-day rhythm at the individual level in both groups. For most individuals (>85%), models incorporating both 30- and 15-day cycles provided a better fit. At the population level, these associations were present in most but not all cohorts, with sleep onset shifts ranging from 6 to over 35 minutes. Notably, the acrophase was consistently aligned near the full or new moon, and when data collection overlapped between Argentina and Seattle, phases were similar in both populations. Strikingly, oscillations in gravitational pull closely mirrored sleep fluctuations.

Conclusions: Our findings reinforce the influence of the lunar cycle on human sleep, though the underlying mechanism remains unclear. While moonlight may contribute, the observed alignment of sleep rhythms with the new moon and gravitational variations suggest additional geophysical influences. The persistence of this effect in an urban setting further supports non-luminance factors in lunar sleep modulation.

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LBA 1556

Sleep Duration and Efficiency are Associated with Dietary Approaches to Stop Hypertension (DASH) Score in Young Adults

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Introduction: Poor sleep health is negatively associated with cardiometabolic health, potentially by influencing dietary behavior. However, data on sleep health, particularly captured with multidimensional sleep assessment, and holistic dietary patterns in young adults remain limited. Therefore, we assessed associations between sleep health with Dietary Approaches to Stop Hypertension (DASH; 1-5) and Healthy Eating Index (HEI; 1-100) scores in young adults.

Methods: Participants (n=104; 52M/52F, 23±4 years old, body mass index = 25.6 kg/m^2) wore wrist actigraphy devices (median wear time = 7.5 days, IQR = 1.75) validated by sleep diary from November 2020 – March 2024. Sleep health measures included sleep duration, efficiency, and midpoint, and variability measures including the standard deviation (SD) of duration, sleep onset time, and midpoint. Diet data were collected via food and fluid diaries (≥3 days) and analyzed for DASH and HEI scores using Nutrition Data System for Research software, whereby higher scores are better. We conducted hierarchical regressions (model 1: bivariate analysis, model 2: race, age, body mass index, sex) to examine associations among sleep health and diet quality and set α to ≤ 0.05.

Results: In bivariate regression analyses, sleep efficiency, sleep midpoint, and duration SD were associated with DASH score ($R^2 \geq .068$, ps ≤ 0.05), while sleep midpoint, duration SD, and sleep onset SD were associated with HEI ($R^2 \geq .097$, ps ≤ 0.05). After inclusion of covariates, sleep duration (B = 0.245, p = 0.051; model: $R^2 = .215$, $p < 0.001$) and sleep efficiency (B = 0.04, $p < 0.05$; model: $R^2 = .224$, $p < 0.001$) were positively and independently associated with DASH. There were no independent associations between sleep health variables and HEI.

Conclusion: Sleep efficiency and duration were independently associated with DASH score. These relations may be bidirectional, thus future studies are needed to investigate whether sleep health interventions improve diet quality.

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LBA 1557

A Likely Ratio Metrics (LRM) of Psychomotor Vigilance Test (PVT) is Associated with Physicians Psychological Health and Safety

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Introduction: We previously showed that response speed and lapses derived from psychomotor vigilance test (PVT) were associated with burnout and depression [Wada H et al. J Sleep Res 2025; 34:e14304.]. A new metrics of PVT, likely ratio metrics (LRM), which conjugate both information of response speed and lapses, is sensitive and one of handy markers [Basner M, et al. J Sleep Res. 2015; 24: 702-713.]. However, it is to be investigated whether or not LRM is associated with psychological health.

Methods: According a previously published study [2], LRM of 1,225 physicians were determined, who joined our study [1]. Depression and burnout were evaluated, using CES-D and abbreviated version of Maslach Burnout Inventory (MBI), respectively. An experience of traffic accident was also assessed as safety metrics, using a questionnaire [1]. Association of LRM with depression, subscales of burnout and experience of traffic accident was assessed, using regression analysis. All the statistical analyses were conducted using SAS version 9.4 (SAS Institute, NC, USA). Statistical significance was defined as p value was <0.05.

Results: LRM was significantly associated with CES-D (estimates [SEM] = 0.040 [0.011], $p<0.001$), sub-scales of MBI, i.e. depersonalization (estimates [SEM] = 0.017 [0.007], $p<0.05$), exhaustion (estimates [SEM] = 0.019 [0.008], $p<0.05$) and accomplishment (estimates [SEM] = - 0.016 [0.007], $p<0.05$) and traffic accident (estimates [SEM] = 0.001 [0.000], $p<0.05$). These associations remained statistically significant after multivariable adjustment.

Conclusion: LRM of PVT is associated not only with vigilance, but also with psychological health, confirming our previous study [Wada H et al. J Sleep Res 2025; 34:e14304.]. Furthermore, LRM is associated with traffic accident, suggesting that LRM of PVT is a better and promising measure of psychological health and safety.

LBA 1558

The Role of Hypersomnolence in the Development of New Physical Medical Conditions Among Older Adults in a Longitudinal Study of the General Population

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Introduction: Several studies have established a correlation between hypersomnolence and psychiatric disorders, oversighting physical medical conditions. Hypersomnolence has also been identified as contributing factor to cognitive decline. However, the implications of hypersomnolence extending beyond psychiatric conditions—particularly its role in the development of other medical illnesses—remain underexplored specially in the general population.

Methods: The initial study was carried with 15,929 individuals from 15 US States. The longitudinal study was carried on in eight of the most populated US states. A total of 12,218 subjects were interviewed by phone during the first wave interview (W1) and 10,930 at the follow-up interview (W2) three years apart. The data analyses were carried in January 2025 and included exclusively the subjects who participated at W1 and W2 (N=10,930). The assessment of hypersomnolence symptoms was conducted according to DSM-5 criteria.

Results: A total of 20.2% of the 55 to 64 y.o. and 22.7% of the >=65 y.o. participants reported hypersomnolence at W1 and respectively, 20.4% and 23.7% at W2. The hypersomnolence was chronic for 41.5% and 40.9% of them. After adjusting for gender, BMI and obstructive sleep apnea, in subjects aged between 55 and 64 y., hypersomnolence at W1 was a risk factor for incident cardiovascular disease at W2 (RR: 3.0 [1.3-6.6]) and incident thyroid disease at W2 (RR: 2.4 [1.1-5.7]). In subjects >=65 y.o., hypersomnolence at W1 (RR: 2.0 [1.4-3.1]) and chronic hypersomnolence (i.e., present at W1 & W2) (RR: 2.1 [1.3-3.5]) were risk factors for incident heart diseases at W2 (RR: 2.0 [1.4-3.1]) and hypersomnolence at W1 predicted incident kidney disease at W2 (RR: 4.9 [2.0-12.1]).

Conclusion: These results imply that hypersomnolence may serve not merely as a symptom but as an early indicator of emerging physical medical conditions in older adults. Given its high association with cardiovascular and thyroid disorders, it is important to recognize and address hypersomnolence reports among older patients.

LBA 1559

The Impact of Caregiving on Insomnia: Gender Differences, Long-Term Health Risks, Child Sleep Patterns, and Scalable Digital Interventions

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Introduction: Parents of young children often experience disrupted sleep due to nighttime awakenings, stress, and irregular schedules. These disturbances increase the risk of chronic insomnia and long-term health issues. Additionally, caregiver sleep behaviors significantly influence child sleep patterns, perpetuating an intergenerational cycle of sleep disruption.

While Cognitive Behavioral Therapy for Insomnia (CBT-I) is effective, caregivers face adherence challenges due to time constraints and competing demands. This study examines caregiver sleep behaviors, gender differences, long-term risks, and child sleep patterns while exploring scalable digital interventions to enhance treatment accessibility.

Methods: A subset (20%) of study participants were caregivers of young children. Their sleep patterns, behaviors, engagement with a digital CBT-I based program called Sleep Reset, and adherence were compared to non-caregivers (80%). Key variables included:

- **Sleep disruptions**: Nighttime awakenings, WASO, sleep efficiency, total sleep time.
- **Gender differences**: Variations in sleep disturbances, stress levels, and program adherence.
- **Behavioral factors**: Irregular schedules, caffeine/alcohol use, bedtime routines, wind-down activities.
- **Environmental influences**: Co-sleeping, bedroom noise, temperature, nighttime light exposure.
- **Psychological stressors**: Self-reported stress, racing thoughts, caregiving-related anxiety.
- **Health implications**: Fatigue, mood disturbances, weight changes, chronic stress.
- **Child sleep impact**: Consistency, nighttime awakenings, caregiver-reported disturbances.
- **Adherence analysis**: Sleep coaching engagement, confidence, dropout reasons.

Results:

- Caregivers had significantly higher sleep fragmentation than non-caregivers, with 70% waking at least once per night vs. 40% of non-caregivers.
- Gender disparities were notable. Female caregivers had longer WASO (45 min vs. 30 min for males), more stress-related awakenings, and lower adherence to structured sleep routines.
- Psychological stress was a major driver of sleep issues—78% of caregivers reported high stress and racing thoughts, leading to longer sleep latency and reduced sleep efficiency.

- Adherence to digital CBT-I based program was lower in caregivers (38% of females, 45% of males) compared to 60% of non-caregivers.
- Health risks included higher rates of fatigue (85%), mood disturbances (62%), and weight gain (45%).

Conclusion: Caregivers face persistent sleep challenges, with significant gender disparities and long-term health risks. Future digital insomnia interventions should be designed to meet caregivers' unique needs by integrating time-efficient, modular CBT-I based programs that fit into their demanding schedules.

LBA 1560

Artificial Intelligence-Driven Prediction of Surgical Outcomes in Single-Port TORS for Obstructive Sleep Apnea

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Introduction: Obstructive sleep apnea syndrome (OSAS) is a prevalent sleep disorder. Although CPAP is the primary treatment, high discontinuation rates necessitate alternative approaches. Transoral robotic tongue base resection with palatal surgery is an emerging surgical approach. This study evaluates the clinical utility of an AI-driven predictive model by analyzing anatomical data and airflow parameters to optimize patient selection and determine airway regions most responsive to surgery.

Methods: This prospective, single-center study enrolled 25 patients with moderate-to-severe OSAS (AHI ≥15 events/hr) who were intolerant to CPAP. Patients underwent SP TORS with expansion sphincter pharyngoplasty as a multilevel surgical approach. Computational fluid dynamics (CFD) and machine learning were used for airway analysis, employing a 3D UNet deep-learning model for CT-based segmentation. A Gaussian process regression model predicted airflow patterns, while a support vector machine classified OSAS severity. The final AI-driven analysis was completed in February 2025 to refine surgical outcome predictions.

Results: CT-based assessments before and after surgery revealed significant increases in airway volume and dimensions, improving patency. Soft-uvula volume increased from 2940.1 ± 1391.7 mm^3 to 3969.6 ± 1672.9 mm^3, uvula-tongue volume from 3852.7 ± 1617.2 mm^3 to 6292.7 ± 2677.2 mm^3, and tongue-epiglottis volume from 6446.3 ± 2577.2 mm^3 to 7111.6 ± 2922.5 mm^3. The anteroposterior width of the nasopharynx increased from 29.5 ± 15.2 mm to 31.2 ± 20.9 mm. Patients with AHI ≥ 15 had smaller airway dimensions than those with AHI < 15, confirming the role of CT-based measurements in OSAS severity classification. Preoperative tongue-epiglottis volume (AUC = 0.950) and uvula-tongue volume (AUC = 0.824) strongly predicted surgical success. Threshold values were identified to determine the minimum airway expansion required for optimal outcomes.

Conclusion: CT-based airway analysis effectively predicts surgical success in OSAS patients undergoing SP TORS. Preoperative tongue-epiglottis and uvula-tongue volumes were key determinants of AHI improvement. Threshold values further aid surgical planning by defining airway expansion criteria. These findings support integrating CT-based

assessments into preoperative planning to enhance patient selection and optimize surgical efficacy.

LBA 1561

Prevalence and Characteristics of Positional Obstructive Sleep Apnea in a Cohort of CPAP-Intolerant Patients: A Retrospective Analysis

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Introduction: Positional obstructive sleep apnea (pOSA) is present in 30-50% of patients with OSA. Although PAP therapy is the primary treatment for OSA, many patients are intolerant to it with subsequent low compliance. There is limited data on whether positional therapy could be a suitable treatment modality in these PAP-intolerant patients. The study aims to evaluate the prevalence and characteristics of pOSA in patients who are intolerant to PAP therapy.

Methods: We retrospectively analyzed charts and baseline sleep studies of 177 patients who were non-compliant with PAP therapy between January 2023 to December 2025. We defined pOSA as overall AHI ≥1.5x the non-supine AHI and a non-supine AHI less than five. We evaluated demographic characteristics and parameters from baseline sleep studies such as AHI, supine AHI, T90, T85, average baseline SpO_2, and average SpO_2 nadir. Unpaired two-tailed T tests were used for means and Chi-squared test was used for categorical variables.

Results: Of the 177 PAP-intolerant patients, 49 patients had pOSA (27.68%). Baseline demographics for pOSA vs NpOSA group were as follows: age in years (55.5 ± 12.2 vs 58.8 ± 14.0, $p > 0.05$), male sex (51% vs 60.9%, $p > 0.05$), female sex (49% vs 39.1%, $p > 0.05$), BMI (36.1 ± 10.7 vs 36.6 ± 9.9, $p > 0.05$). Compared to the NpOSA group, pOSA patients had a significantly lower mean AHI (20.3 vs. 29.8, p=0.01) and less severe oxygen derangements, as evidenced by a lower T90 (7.0% vs. 25.2%, p=0.02) and T85 (1.2% vs. 5.0%, p=0.04) as well as a higher average baseline SpO_2 (92.7% vs. 91.5%, p=0.03) and mean SpO_2 nadir (79.0% vs. 75.6%, p=0.04). In the pOSA group, 49% (n=24) were mild, 28.6% (n=14) were moderate, and 22.4% (n=11) were severe.

Conclusion: pOSA is highly prevalent among PAP-intolerant patients, with distinct differences in apnea severity and oxygen desaturation compared to NpOSA patients. Early identification and initiation of positional therapy in these patients could enhance risk reduction and provide a treatment option for an already vulnerable population. Further investigation is warranted to evaluate the effectiveness of positional therapy alone and in combination with other OSA treatments in this population.

Resources:

1. https://pmc.ncbi.nlm.nih.gov/articles/PMC6491901/
2. https://www.resmedjournal.com/article/S0954-6111(23)00115-4/pdf

LBA 1562

Perinatal Depressive Symptom Trajectories and Incident Metabolic Syndrome after Delivery

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Introduction: Depression and disturbed sleep are considered modifiable risk factors for cardiovascular disease, yet are not well-studied in perinatal populations. Thus, we investigated the association between perinatal depressive symptom trajectories and incident metabolic syndrome 2-7 years after delivery, and whether this association is moderated by sleep characteristics.

Methods: Participants (N = 4,092) from the nuMoM2b Heart Health Study were grouped by trajectories of perinatal depression, assessed using positive Edinburgh Postnatal Depression Scale (EPDS), in the first or third trimester of pregnancy and 2-7 years after delivery. A positive screening was an EPDS score ≥ 10. Groups included never depressed, persistently depressed, new-onset depression 2-7 years after delivery, and depression that resolved after delivery. Incident metabolic syndrome at 2-7 years after delivery was assessed using standard clinical criteria. Sleep characteristics in first and third trimesters included late sleep midpoint (**>5 AM)** , short sleep duration (<7 hours), long sleep duration (>9 hours), and average social jetlag. In February 2025, risk ratios were calculated using Poisson regression with robust standard errors, adjusting for baseline covariates including age, government insurance, and smoking within three months of pregnancy. Interaction terms assessed moderation by sleep characteristics.

Results: Those with persistent (RR 2.12, 95% CI: 1.72-2.61, p < 0.001), new-onset (RR 1.75, 95% CI: 1.38–2.22, p < 0.001), and resolved (RR 1.37, 95% CI: 1.10-1.70, p = 0.005) depression trajectories were significantly more likely to have incident metabolic syndrome as compared to those who were never depressed. After adjustment, persistent (aRR 1.87, 95% CI: 1.50-2.32, p < 0.001) and new-onset (aRR 1.67, 95% CI: 1.32-2.12, p < 0.001) trajectories remained associated with higher risk for incident metabolic syndrome. A

marginal interaction was observed between **resolved depression and late sleep midpoint** (*RR* 2.25, 95% CI: 1.08, 4.66, *p* = .030).

Conclusion: New-onset and persistent depressive symptoms in the years after first birth were associated with higher risk for incident metabolic syndrome. Sleep characteristics did not significantly moderate these associations. These findings indicate that perinatal depression screenings may be important in identifying individuals at risk for adverse cardiometabolic health outcomes.

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LBA 1564

White Matter Changes in Patients with Narcolepsy Type 2: Peak Width of Skeletonized Mean Diffusivity Study

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Introduction: This study aimed to investigate white matter (WM) microstructural alterations in patients with narcolepsy type 2 (NT2) using Peak Width of Skeletonized Mean Diffusivity (PSMD), a novel imaging marker associated with small vessel disease (SVD). The study compared PSMD metrics between patients with NT2 and healthy controls to investigate structural disruptions and their implications for NT2 pathophysiology.

Methods: This retrospective study involved data collection beginning in December 2024, with analysis conducted until January 2025. A total of 42 participants were enrolled, including 20 patients with newly diagnosed NT2 and 22 healthy controls. Diffusion tensor imaging (DTI) was performed using a 3 Tesla MRI scanner. PSMD was calculated using a multi-step process involving preprocessing, skeletonization, application of a custom mask, and histogram analysis with the FSL program. PSMD values were compared between patients with NT2 and healthy controls, and correlation analyses were conducted to examine associations between PSMD and clinical variables.

Results: Patients with NT2 exhibited significantly higher PSMD compared to healthy controls (2.172×10^{-4} mm^2/s vs. 2.031×10^{-4} mm^2/s, $p=0.011$). PSMD also positively correlated with age in both patients with NT2 ($r=0.608$, $p=0.004$) and healthy controls ($r=0.696$, $p<0.001$).

Conclusion: Patients with NT2 demonstrate increased PSMD, indicating WM microstructural changes potentially linked to SVD. These findings highlight the utility of PSMD as a sensitive neuroimaging marker for detecting WM alterations in sleep disorders. Further studies are needed to validate these results and investigate the underlying mechanisms of WM changes in NT2.

LBA 1565

Evaluating the Impact of Patient Support Group Events in Narcolepsy Patients

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Introduction: Narcolepsy brings a multifaceted set of challenges that impact patients' lives and well-being. Support groups offer a way for shared experiences, coping strategies, and education for event goers. This study examines the impact of support groups on patients, friends, and families.

Methods: Participants attending "Wake Up Narcolepsy", a support group for individuals affected by Narcolepsy, were asked to complete surveys immediately before and after each event. Surveys were collected and evaluated by December 2024. A paired t-test was conducted on data from individuals who completed both surveys to assess changes in self-reported outcomes. Additionally, open-ended responses were collected and analyzed to identify themes and compare frequently discussed topics.

Results: Analysis of the paired survey data revealed statistically significant improvements in patient's perception of event groups, coping skills, knowledge, and connection with others ($p<0.05$). Most participants (41%) attended this type of event for the first time. Qualitative findings showed that individuals primarily attended these events to find connection and community as well as obtain more medical information regarding narcolepsy.

Conclusion: The findings suggest that narcolepsy support groups may play a vital role in supporting medical care by fostering an improved sense of connection, emotional support, and self-management skills. This highlights the importance of addressing psychosocial factors in those affected with narcolepsy as clinical management, invoking exploration into integrative approaches in patient care.

Support: None

LBA 1566

Analysis of Online Forums using Topic Modeling for the Evaluation of Fears and Concerns Regarding Hypoglossal Nerve Stimulators

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Introduction: Topic modeling cluster analysis is a method in unsupervised machine learning that can help health care providers find insight into the worries and apprehensions of patients dealing with medical conditions. We explore these concerns by analyzing data from an online support group dedicated to sleep apnea and discussions surrounding hypoglossal nerve stimulators.

Methods: Subreddit post and comments were obtained February 2025 through the "r/SleepApnea" subreddit by searching for "Inspire". A list of concerns for each post was extracted through one-shot batch prompting via a large language model (LLM). They were then transformed into text embeddings and reduced to a lower dimensionality while preserving local and global structure via Universal Manifold Projection and Approximation (UMAP). Hierarchical Density-Based Spatial Clustering of Applications with Noise (HDBSCAN) was utilized to identify meaningful clusters while filtering out for noise. Both UMAP and HDBSCAN were optimized to achieve maximum cluster separation and cohesion, as evaluated by silhouette scores, Davies-Bouldin (DB) index, and Calinski-Harabasz (CH) index. Formed clusters were individually examined and thematically labeled through one-shot prompting via the same LLM. To evaluate thematic label quality, we examined the distribution of cosine similarity scores across all data points within each cluster. Cluster frequencies were also analyzed.

Results: 10 clusters were identified each with thematic topics. Silhouette scores, DB, and CH scores were 0.64, 0.47, and 2133 respectively, providing a significant level of inter-cluster separation and intra-cluster cohesion. Cosine similarity means for each cluster ranged from 0.44 to 0.75. Topics including "Surgical Recovery Challenges" and "Complications & Challenges" were the most frequently discussed themes.

Conclusion: Text embeddings provide a rich and nuanced way of mapping thoughts and ideas into continuous vector spaces where semantic relationships are preserved. Topic modeling has the potential to improve physician-patient relationships by unveiling latent themes in social media support group online platforms which may help guide providers towards having more directed and meaningful patient interactions.

Support: None

LBA 1567
Progesterone and Estrogen Use in Women's Midlife Sleep

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Introduction: Poor sleep quality is a common complaint during the menopause transition contributing to physical and cognitive symptoms. Sleep disruptions can occur in the presence or absence of vasomotor symptoms of menopause (hot flashes, night sweats). Progesterone and estrogen-based prescriptions may improve sleep during and after the menopause transition, depending on timing and duration of use, though this is not an FDA-approved indication. The Critical Window Hypothesis (CWH) emphasizes the importance of timing to achieve optimal benefits of hormone-based medications. We investigated whether duration of hormone-based medication use was associated with sleep quality among women aged 40 and older.

Methods: We present findings from a convenience sample of 98 women enrolled in an online survey at various stages of menopause (pre-, peri-, and post-). We explore cross-sectional associations between retrospective self-reported timing and duration of progesterone and estrogen usage on current sleep quality using linear regressions, adjusting for age and education. Measures include the Pittsburgh Sleep Quality Index (PSQI) and its subscales (subjective sleep quality, latency, duration, efficiency, disturbance, sleep medication use, daytime dysfunction), and a self-reported hormone medication-use survey. Duration of hormone medication-use ranged from less than six months to more than eight years. This data became accessible in January 2025.

Results: Participants had a mean age of 49.47 (53.1% non-Hispanic white, 24.5% Hispanic/Latina, 17.3% African American, 8.2% rural-dwelling, 63.3% college-educated and above). Longer reported use of progesterone (OR = 0.18, $p = 0.017$) and estrogen (OR = 0.28, $p = 0.047$) were associated with lower PSQI scores, indicating better overall sleep quality. For subscale scores, longer progesterone use was associated with shorter sleep onset latency (OR = 0.43, $p = 0.009$) and less daytime dysfunction (OR = 0.48, $p = 0.020$). Longer estrogen usage was associated with less daytime dysfunction (OR = 0.60, $p < 0.001$).

Conclusion: These results support the CWH and suggest duration of hormone-based medications may impact specific aspects of sleep quality in midlife women. Future research should examine the long-term effects of interventions on specific aspects of sleep quality, considering both the duration of use and its timing relative to the CWH.

LBA 1568

How Does Blood Sugar Level Affect the Wound Infection Rates and Device Revision/Removal Rates After Hypoglossal Nerve Stimulation Procedure in Obstructive Sleep Apnea Patients? A Large Database Study

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Introduction: Hypoglossal nerve stimulation (HGNS) has been established as an effective and minimally invasive surgical intervention for select patients with obstructive sleep apnea (OSA) since 2014. Similar to cardiac implantable electronic devices (CIEDs), HGNS poses an inherent risk of infection as a long-term implanted foreign body in the chest. While risk factors for CIED infections have been extensively studied, large-scale population-based studies evaluating infection risk factors for HGNS remain lacking.

Methods: A retrospective cohort study was conducted using the TriNetX Analytics Network on March 7th, 2025. OSA patients who underwent HGNS implantation were categorized into hyperglycemic cohort if they had 6 months before and after implantation laboratory data exceeding set glucose thresholds (126 mg/dL and 154 mg/dL). Otherwise, they were in non-glycemic cohort. Baseline demographic characteristics and comorbid conditions were compared between cohorts. Postoperative wound infection and device revision, replacement or removal rates were assessed at one-year and three-year follow-up intervals. Outcomes were analyzed using incidence rates, odds ratios (ORs), and Log-Rank tests, with propensity score matching employed to control for confounding variables.

Results: We ran four analyses for the same study population with 2 laboratory thresholds and 2 outcome endpoints. Patients with serum glucose levels ≥126 mg/dL and ≥154 mg/dL exhibited significantly higher incidence rates of surgery-related wound infections compared to their respective counterparts (one-year OR: 1.72 and 1.78; three-year OR: 1.81 and 2.06; all $p \leq 0.001$). These findings remained statistically significant after propensity score matching (one-year OR: 1.71 and 1.77; three-year OR: 1.79 and 2.10; all $p < 0.05$). However, there were no significant differences in device revision, replacement or removal rates between hyperglycemic and non-hyperglycemic cohorts at both one-year and three-year follow-ups ($p > 0.05$).

Conclusion: Hyperglycemia is associated with a significantly increased risk of wound infection, including long term infection (3 years) following HGNS implantation, while device revision/explantation rates remain unaffected. These findings underscore the importance of

stringent perioperative glycemic control to mitigate postoperative infection risk in HGNS recipients.

LBA 1569
Identifying Challenges in Insomnia Treatment

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Introduction: Chronic insomnia affects approximately 10-15% of the general population. Like other sleep disorders, chronic insomnia co-occurs with chronic conditions resulting in a costly comorbidity burden and an acceleration of poor health outcomes. While safe and effective treatments exist—most notably cognitive behavioral therapy for insomnia (CBT-I), the first-line treatment recommended by clinical guidelines—real-world practices often demonstrate a reliance on second-line pharmacological interventions, which are not intended for long-term use. This study aimed to identify real-world insomnia treatment patterns in claims data.

Methods: A retrospective analysis was conducted in January 2025 using a proprietary de-identified database (Certilytics, Inc.) which included commercial medical and pharmacy claims enriched with enrollment data. This study examined 2.8 million continuously enrolled individuals (aged 18-64 years) over a 36-month period (2019-2022), analyzing insomnia diagnosis rates, treatment utilization patterns, medication classes and durations of use, and CBT-I therapy.

Results: 209,568 patients were observed with an insomnia diagnosis code, which is an insomnia prevalence of 7.5%. 53.4% of diagnosed patients received some form of treatment. Of this group, only 8.5% received first-line CBT-I (3.1% received CBT-I only and 5.4% received CBT-I and medications together). Of those who received any form of treatment, 96.6% were prescribed second-line drug therapy. Among patients with prescriptions, an average of 72.4% received controlled substances annually, which carry significant risks due to potential adverse effects. Notably, 71.5% of these patients used these medications beyond the durations recommended by clinical guidelines.

Conclusion: The observed insomnia prevalence aligns with existing literature. Treatment utilization indicates that many patients remain untreated with first-line CBT-I, likely reflecting barriers such as limited geographic access and a shortage of trained providers (659 nationwide in the U.S.). There is a troubling overreliance on second-line treatments, particularly prescription medications, which carries risk of dependence, withdrawal, misuse, and addiction, leading to suboptimal outcomes. Digital CBT-I platforms, such as the evidence-based, FDA-cleared prescription digital therapeutic Somryst, address these care gaps and offer a pathway to long-term health benefits.

Support: This study was funded by Nox Health Inc. and supported by Risk Strategies Consulting, Inc.

LBA 1570

Electrical Vestibular Nerve Stimulation for PTSD: Does It Improve Insomnia? Findings from a Randomized Controlled Trial

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Introduction: The complex relationship between sleep and posttraumatic stress disorder (PTSD) is well researched, with ~90% of individuals with PTSD experiencing insomnia. However, PTSD treatments do not target insomnia with 70% of patients reporting sleep disturbances following trauma-focused treatment. Our aim was to explore the impact of a non-invasive, electrical vestibular nerve stimulation (VeNS) treatment for PTSD on insomnia symptoms.

Methods: This study, completed on the 2nd December 2024, was a double-blind, randomised, sham-controlled trial that evaluated the efficacy and safety of VeNS on PTSD (N=383). The study (NCT05242367) was undertaken remotely across the US and included adults (22-80 years) with PTSD (mean age: 43.1±5.0 yrs; 56% female). Participants were required to have a PTSD Checklist for DSM-5 (PCL-5) score of ≥31, with eligibility confirmed using the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5). Eligible participants who provided written consent, were randomly assigned (1:1 allocation) to receive an active device (n=191) or a sham device (n=192). All participants were instructed to complete 30-minute stimulation sessions daily, over a period of 12 weeks. The primary outcome was change in PCL-5 score from baseline to week 12. A secondary outcome was change in Insomnia Severity Index (ISI) at 12 weeks.

Results: The mean duration of a PTSD diagnosis was 10.7 years and 77% of participants reported having moderate to severe insomnia (ISI score ≥15) at baseline. Treatment compliance was high in both groups (active: 84% vs. sham: 83%). Both the intention-to-treat (ITT) and per protocol (PP; n=201) analyses showed that the active group, compared to the sham group, reported a greater mean reduction in PCL-5 scores (ITT: -21.99 vs. -16.93, p=0.024; PP: -24.62 vs. -17.31, p=0.002) as well as a greater mean reduction in ISI scores (ITT: -7.30 vs. -4.76, p=0.003; PP: -7.98 vs. -3.27, p<0.001). Furthermore, significantly more participants in the active group achieved a 6-point reduction in ISI, which is considered clinically meaningful (ITT: 59% vs. 44%, p=0.007; PP: 61% vs. 42%, p=0.007).

Conclusion: The findings show that VeNS significantly improves PTSD and has a clinically meaningful impact on insomnia, making it a potential treatment for adults with both conditions.

LBA 1571
Change in Sleep Duration Following a Cancer Diagnosis

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Introduction Although survivors of cancer often report disruptions to their sleep patterns, it is unclear how the experience of a cancer diagnosis may impact subsequent sleep duration patterns. The objective of this study was to investigate how cancer impacts subsequent sleep duration using data from the Cancer Prevention Study-3 (CPS-3).

Methods The CPS-3 is a prospective cohort of ~300,000 US adults aged 30-65 years. At baseline (2006-2013), and in 2015 and 2018, participants were asked to report their average daily sleep duration over the past 2 years for weekdays and weekends separately. Using the midpoint of each sleep duration category, a 5:2 weekday:weekend weighted average sleep duration was created for each survey timepoint. Cancer incidence was determined via linkage to state registries. Participants who experienced a cancer diagnosis during study follow-up that had complete sleep data prior to and after cancer diagnosis were included. We matched individuals with a cancer diagnosis to participants without a cancer diagnosis during follow-up (1:4 ratio) based on age at study enrollment, sex, year of cohort entry, and timing of available sleep duration measures. Change in sleep duration was calculated as the difference between pre- and post-reference sleep duration measurements. We used multivariable multinomial logistic regression to estimate odds ratios (OR) and 95% confidence intervals (CI) for the association between receiving a cancer diagnosis and longitudinal change in sleep duration (decrease, no change, increase), adjusted for demographic, lifestyle, and health factors.

Results Of the 20,235 included CPS-3 participants (4,047 cancer survivors), the majority (78%) were female and average age at baseline was 53.6 years (SD=8.5). Among cancer survivors and matched counterparts, 17% and 15% reported increased weighted sleep duration, respectively. Participants who received a cancer diagnosis had higher odds of increasing weekly sleep duration (OR= 1.15, 95% CI 1.04, 1.26) compared to participants who did not receive a cancer diagnosis. Associations persisted in analyses restricted to female participants with a diagnosis of any cancer (OR= 1.17, 95% CI 1.05, 1.31) or breast cancer only (OR= 1.21, 95% CI 1.04, 1.42).

Conclusion The diagnosis of cancer may lead to increased sleep duration beyond expected age-related changes.

Support: This analysis was also supported through an unrestricted research grant from Sleep Number Corporation.

LBA 1572

Persistent Performance Deficits Following 1 Week of Mild to Moderate Sleep Restriction

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Introduction: Chronic sleep restriction (CSR), defined as obtaining less than 7 hours of sleep per night on a regular basis, is common in the general population. In the early 2000s, landmark research characterized the neurobehavioral consequences of CSR. In part, these studies found (1) a dose-response relationship between sleep and performance, and (2) relatively long-lasting degradations in performance that persisted for several days after conclusion of the studies. More recently, preclinical studies with animal models have been conducted to better characterize the changes in brain health that occur during CSR and that underlie performance deficits. It is unknown whether similar changes are observed in humans and (if so) how long they persist.

Methods: Seven healthy adults (ages 18-39, 2 females) participated in a 55-day study involving baseline, one week of CSR (5h time-in-bed/night), and a one month recovery period. Data collection concluded in March 2025. In-lab procedures included performance assessments, EEG/PSG recordings, and blood samples at regular intervals. In addition, Magnetic Resonance Imaging (MRI) was conducted at baseline (T1), the middle and end of sleep restriction (T2-T3); and again following recovery sleep and one month later (T4-T5). Positron Emission Tomography (PET) imaging of translocator protein, synaptic vesicular protein 2A, and beta-amyloid were conducted at T1, T3, and T5. Preliminary analyses were focused on Psychomotor Vigilance Test (PVT) mean speed (1/RT) and Karolinska Sleepiness Scale (KSS) ratings that were measured on the days preceding MRI/PET scans. Data were analyzed with mixed-effects ANOVA with a main effect of study day and random intercept over subject.

Results: PVT mean speed significantly increased across one week of sleep restriction and had failed to return to baseline levels one month later ($F=3.40$, $p=0.03$). While KSS ratings increased with sleep restriction and decreased with recovery, these changes did not achieve statistical significance.

Conclusions: Preliminary results suggest that sleep restriction-induced performance deficits are still evident after one month of sleep at home. Data analyses are ongoing and will identify changes in sleep physiology and brain health (white matter integrity, damage to

arousal nuclei, cerebral blood flow, BOLD-CSF coupling, etc.) that may underlie these performance deficits.

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LBA 1573

Local Disruptions in Non-Rapid Eye Movement Sleep Expression are Associated with Cerebrovascular Pathology and Worse Memory Performance in Older Adults

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Introduction: Aging is associated with disruptions in non-rapid eye movement (NREM) sleep, memory decline, and increased burden of cerebral small vessel disease (CSVD), though little is known about how CSVD impacts NREM sleep and subsequently, memory in older adults.

Methods: Fifteen cognitively intact older adults (mean age 71.8±6.3 years, 10 female, Apnea Hypopnea Index (AHI)=7.82±7.95) underwent T2-weighted fluid-attenuated inversion recovery MRI, an overnight polysomnography with 128-channel EEG, and a sleep-dependent mnemonic discrimination task was administered. Lobar white matter hyperintensity volumes (WMHv) were calculated using a validated semi-automated toolbox.

Results: Older age was associated with lower absolute sigma power (all $p<0.016$, $r>-0.61$) and slow wave activity (SWA) (all $p<0.017$, $r>-0.61$) over centro-posterior EEG derivations. Age was also positively associated with frontal ($\tau=0.51$, $p<0.01$) and parietal ($\tau=0.49$, $p<0.01$) but not occipital ($\tau=0.33$, $p=0.092$) or temporal ($\tau=0.36$, $p=0.064$) WMHv. Increased occipital WMHv was not associated with AHI ($\tau=0.038$, $p=0.843$), but was associated with global reductions in alpha activity (all $p<0.043$, $\tau>-0.78$), centro-posterior reductions in SWA (all $p<0.043$, $\tau>-0.63$) and Delta (all $p<0.009$, $\tau>-0.63$), frontal reductions in total (all $p<0.043$, $\tau>-0.71$) and fast sigma power (all $p<0.004$, $\tau>-0.57$), global reductions in slow sigma power (all $p<0.043$, $\tau>-0.71$), and central reductions in theta activity (all $p<0.042$, $\tau>-0.57$). Better lure discrimination for low similarity lures was significantly positively associated with higher relative slow oscillation expression over fronto-parietal regions, though this did not survive TFCE correction (all $p<0.033$, $r>0.55$).

Conclusions: These findings indicate that WMH burden in older adults is associated with local disruptions in NREM sleep expression in multiple frequency bands, of which lower frequencies were particularly vulnerable, the latter of which predicted weakened memory performance.

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LBA 1574

The Effect of Treating Acute Decompensated Heart Failure in Patients with Newly Diagnosed Sleep Apnea: Preliminary Results

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Introduction: Acute decompensated heart failure (ADHF) can worsen sleep disordered breathing (SDB). The extent to which SDB improves with standard of care treatment for ADHF has not been well described. The purpose of this study is to evaluate the severity of SDB in patients with ADHF before and after initiation of standard of care treatment.

Methods: This is an observational prospective study conducted at a tertiary care center. Inclusion criteria included hospitalized patients with a diagnosis of ADHF and age >18 years. Exclusion criteria included previous sleep apnea diagnosis, PAP usage, and supplemental oxygen requirements. SDB was evaluated with a type 3 sleep study. An initial sleep study was performed within 48 hours of admission and a second study was performed when deemed clinically optimized before discharge. Studies were scored according to AASM guidelines using AHI-3%. Standard of care treatment was defined as diuresis and GDMT initiation. We evaluated baseline demographics, changes in weight, prevalence of sleep apnea, and changes in sleep parameters including AHI, RDI, ODI, %Centrals, T90, T85, lowest SpO2, and average SpO2. Statistical analyses were performed with paired T-tests.

Results: Baseline demographics for the participants (n=6) are as follows: mean age (45.2 years), male sex (n=3), female sex (n=3), ejection fraction ≤ 20% (n=6), and predominant CSA (n=3). After standard of care treatment initiation, there was a significant reduction in mean AHI (36.6 ± 6.0 vs. 22.9 ± 5.7, p=0.045), mean RDI (36.6 ± 6.0 vs. 22.9 ± 5.7, p =0.01), and mean ODI (37.8 ± 6.0 vs. 23.9 ± 6.4, p=0.018). There was also a nonsignificant reduction in the mean CAI (18.2 ± 4.9 vs. 8.6 ± 3.1, p=0.06). Cheyne-Stokes respirations (CSR) were present in all patients. Weight was significantly reduced (82.6 ± 6.63 vs 80.1 ± 7.1, p =0.045).

Conclusion: Our data suggests a high prevalence of severe SDB and CSR in patients with ADHF. In addition, there is a possible relationship between treatment of ADHF and SDB improvement. However, many of these patients still experienced residual SDB, emphasizing the importance of screening for SDB in this patient population. Further investigation is needed to elucidate any causal relationships.

LBA 1575

Early Indicators of Sleep and Self-Regulation in Infancy and Bedtime Difficulty in Preschool Years

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Introduction: Sleep disturbances and self-regulation (SREG) greatly impact infants and preschoolers' development and are often not identified until preschool years. The purpose of this study was to determine if sleep and self-regulation indicators in infancy (6-16 months) were associated with bedtime difficulty in preschool years.

Methods: The First Years Inventory (FYI) is a parent-report measure of risk for neurodevelopmental conditions in infancy. We focused on risk scores for 3 sleep-specific questions (night wakings, difficulty falling asleep, and being easily woken) and the self-regulation (SREG) construct. The FYI was collected on 97 infants ages 6-16 months (mAge 11 months). Participants were contacted at 3 years old to complete four questions from the Brief Infant Sleep Questionnaire (BISQ). This analysis specifically focused on difficulty with bedtime as the dependent variable because this is most related to SREG. Difficulty with bedtime is a 1-5 scale of difficulty. Two linear regression models (performed March 2025) with FYI sleep questions and SREG separately, sex, and age as independent variables and difficulty with bedtime as the dependent variable.

Results: The SREG construct of the FYI was significantly associated with bedtime difficulty at three years old (B = 0.67 p = .04), controlling for sex (B = 0.24 p = .2) and age (B = -0.01 p = .51). The FYI question which asks if the infant is easily woken by sounds was significantly associated with bedtime difficulty (B = 0.44 p = .03), and there were no significant associations between FYI wake ups (B = -0.2 p = .41) and falling asleep (B = 0.10, p = .37) in infancy related to bedtime difficulty at 3 years old after controlling for age and sex.

Conclusion: Self-regulation in infancy being related to difficulty with bedtime in preschool years indicates that one potential reason for sleep difficulties can be identified in infancy. Reduced self-regulation in infancy and sleep disturbances in preschool years are both likely to adversely impact health and development and are interrelated. Identifying those at increased likelihood of sleep disturbances earlier provides critical opportunities for intervention and the possible improvement of sleep.

LBA 1576

Associations Between Sleep Aid Use and Self-Reported Parasomnias in a Cohort of 370,000 Sleep Disorder Patients

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Introduction: This study investigates the association between sleep aids and self-reported parasomnias, including sleep-related eating disorder (SRED), hypnagogic hallucinations, sleep paralysis, somnambulism, and somniloquy, using a large-scale dataset of 371,889 individuals with sleep disorders.

Methods: We analyzed data from a multi-center US sleep database, with 371,889 patients answering parasomnia-related questions. A previous study (Hanif et al., Psychiatry Clin. Neurosci., 2024) analyzed parasomnias in relation to sleep metrics and comorbidities, including a preliminary assessment of sleep aids. In December 2024 - January 2025, we enhanced this dataset and refined this analysis by comparing sleep aid users to a broader control group of patients who did not report using sleep aids.

We conducted univariate logistic regression to assess parasomnia risk associated with each drug category, controlling for age, sex, and symptoms correlated with sleep aid use (falling asleep depressed or worried, diagnosed depression, musculoskeletal pain). We additionally controlled for **insomnia severity** to further isolate drug effects. Statistical significance was set at $p < 0.05$ (after Bonferroni correction).

Results: When adjusting only for age and sex, all sleep aids were associated with increased parasomnia risk. After controlling for associated symptoms, medications associated with increased parasomnia likelihood included antipsychotics (1.88), mirtazapine (1.64), opioids (1.52), TCAs (1.35), trazodone (1.22), benzodiazepines (1.16), and Z-drugs (1.15). Hallucinations were specifically linked to antipsychotics (1.55), while sleep paralysis showed no significant associations except a reduced risk with antihistamines (0.79). SRED exhibited the highest ORs among parasomnias, particularly for antipsychotics (2.22), opioids (1.68), Z-drugs (1.59), benzodiazepines (1.48), and trazodone (1.33).

When additionally controlling for insomnia severity, increased parasomnia occurrence remained significant for antipsychotics, mirtazapine, opioids, TCAs, and trazodone, while benzodiazepines and Z-drugs had mixed effects. Notably, melatonin, antihistamines, and NSAIDs with acetaminophen were associated with reduced parasomnia risk.

Conclusion: Parasomnias were significantly associated with hypnotic use, particularly depression and anxiety medications, even after correcting for depression, anxiety, pain, and insomnia severity. Most sleep aids were linked with increased risk, particularly for

SRED, while a few over-the-counter drugs showed reduced risk, suggesting potentially protective effects. These findings suggest complex drug-parasomnia interactions, warranting further investigation.

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LBA 1577

Characterising Iatrogenic Sleep Disturbances Induced by Dexamphetamine and Lisdexamfetamine Treatments to Suppress Binge-Like Eating in Female Rats

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Introduction: Binge eating disorder (BED), characterized by recurring episodes of excessive, rapid-paced food consumption over a short period, is often comorbid with sleep disturbances, most commonly insomnia. The only FDA-approved BED medication, lisdexamfetamine, which is metabolized to dexamphetamine, broadly suppresses appetite and can reduce binge episode frequency. However, lisdexamfetamine treatment has also been associated with worsened sleep outcomes, especially when administered in the evening when most binge episodes occur. Despite this, no quantitative studies (clinical or preclinical) have assessed lisdexamfetamine- and dexamphetamine-induced sleep disturbances at doses that suppress binge eating.

Methods: Adult female Long Evans rats were implanted with wireless telemetry probes to record electroencephalographic and electromyographic data. Polysomnographic (PSG) recordings were scored for wake, NREM, and REM sleep to assess sleep outcomes. Binge-like eating was measured using an intermittent access model, where rats with *ad libitum* chow received a sweetened fat mixture (8.6 kcal/g) for 30 min twice weekly on nonconsecutive days. Dexamphetamine hemisulfate (0.1875, 0.375, 0.75, 1.5 mg/kg) and lisdexamfetamine mesylate (0.463, 0.927, 1.854, 3.371 mg/kg) were administered via the intraperitoneal route. For sleep assessment, 19-h PSG recordings (ZT23-ZT18) were conducted with drug administration at ZT23. For assessment of binge-like eating, drugs were administered 30 min before testing (ZT20-22).

Results: Dexamphetamine and equivalent doses of lisdexamfetamine dose-dependently suppressed binge-like eating and disrupted sleep. At the lowest effective doses that attenuated binge-like eating, both drugs markedly delayed sleep and REMS onset, increased wake time, and reduced both NREM and REM sleep during the first 3 hours of the light phase, with little to no rebound sleep recovery observed at later timepoints. Quantitative EEG analyses are ongoing, as PSG data collection was completed in February 2025.

Conclusion: We confirm qualitative clinical reports of significant iatrogenic sleep disturbances induced by lisdexamfetamine and its active metabolite used as a treatment to suppress binge eating. As poor sleep can itself enhance appetite and shift preferences to calorie-dense palatable foods (i.e., those typically consumed during binge episodes),

novel treatments that suppress binge eating without causing iatrogenic sleep problems are warranted.

Funding: New Jersey Health Foundation (PC144-23) and National Institute of Drug Abuse (R37 061303).

LBA 1563

Regularity of Sleep-Wake Timing and Risk of New-Onset Heart Rhythm Disorders: A Pre-Registered, Prospective Analysis of 69,725 UK Biobank Participants

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Introduction: Health implications of the consistency of sleep-wake timing remain exploratory, although emerging research has identified irregular sleep-wake timing as a potential risk factor for all-cause and cardiovascular mortality. Irregular sleep-wake timing co-occurs with and contributes to circadian misalignment, a potential risk factor for arrhythmogenesis, and recent laboratory studies in mice and humans have identified multiple mechanisms by which circadian rhythms regulate cardiac pacemaking activity. We investigated the relationship between accelerometer-measured sleep regularity and new-onset heart rhythm disorders, including cardiac arrhythmias and conduction disorders.

Methods: In this pre-registered analysis, we analyzed data from a prospective UK Biobank cohort with 7-day accelerometer recordings between 2013–2015 and no diagnosed heart rhythm disorders up to one year after accelerometer recording. Timestamped sleep-wake estimates were used to calculate Sleep Regularity Index (SRI) scores, reflecting the average probability that participants were in the same state (awake or asleep) at timepoints separated by 24 hours. Time-to-event analyses were performed for new-onset cardiac arrhythmias, conduction disorders, or either with SRI quintile as the predictor, time since accelerometer recording as the timescale, and for full adjustment: sex, age, ethnicity, employment, Townsend deprivation, sleep duration, physical activity, smoking pack-years, alcohol use, self-rated health, and pre-accelerometer comorbidities.

Results: The primary analytic sample included 69,725 participants, of whom 39,980 (57.3%) were female and 30,981 (44.4%) were aged 60–69 years, followed for a median of 7.5 (IQR 6.9–8.0) years. Overall, 4,318 (6.2%) participants experienced new-onset heart rhythm disorders. Compared to participants with highly regular sleep-wake schedules (80–

100th percentile SRI), those in the highly irregular schedules (0–20th percentile SRI) had significantly higher risk of all outcomes (e.g., any heart rhythm disorder, hazard ratio 1.20 [95% CI 1.08–1.32] p=0.0004). Post-hoc analysis reveals that the elevated risk was driven primarily by male participants with baseline cardiovascular disease.

Conclusion: Minimizing highly irregular sleep-wake timing may reduce the risk of heart rhythm disorders, independent of sleep duration. Sleep regularity may be a practical modifiable behavioral risk factor to reduce arrhythmogenesis.

Support: No direct funding was provided for this study.

LBA 1579
Impact of Sleep Education and Hygiene Training on Sleep Health Behavior

Authors: Kate M. Goldstein, Jennifer C. Parada, Daniel Lewin

Introduction: We investigated whether sleep education (SE) alone or SE with sleep hygiene training (SE+H) improves sleep behavior and regularity. We hypothesized that SE+H would show greater improvements compared to those only exposed to education. We also examined whether higher Adverse Childhood Experiences (ACE) scores or lower Perceived Neighborhood Cohesion (PNC) scores are correlated with sleep regularity and hygiene.

Methods: Washington State residents (ages 18 to 65) were randomly assigned to the SE or SE+H groups. Starting January 6, 2025, participants took a Qualtrics survey on bedtime routines, average sleep duration, sleep quality (Pittsburgh Sleep Quality Index (PSQI), sleep hygiene (Sleep Hygiene Awareness and Practice Scale (SHAPS), demographics, ACEs and the PNC scale. The SE+H group watched a 5-minute video with psychoeducation plus sleep hygiene training, while the SE groups' identical video excluded sleep hygiene training. No other interventions were provided. Follow-up surveys were completed two weeks later, with the study closing on February 20th, 2025.

Results: Twenty-two participants (55% young adults [ages 18-25], 64% white, 77% women) participated in the study. Participants who watched *either* sleep video displayed improved sleep hygiene as measured by the SHAPS practice subscale ($t(21) = 2.54$, $p = .009$), and improved sleep quality as measured by the PSQI ($t(21) = 1.97$, $p = .031$). There were no between-group differences in sleep knowledge, hygiene, or quality in the pre- and post-survey data (all p values > .168).

Post-hoc analyses revealed a moderate correlation between a lack of sleep quality and higher Adverse Childhood Experiences ($r = .320$, $p = .044$). Additionally, we found a moderate relationship between higher sleep quality and higher Perceived Neighborhood Cohesion scores, ($r = .455$, $p = .033$).

Conclusion: Our brief sleep education intervention had a positive impact on sleep hygiene and health, perhaps more so in young women. Higher ACEs and lower PNC scores are linked to poorer sleep hygiene and regularity. Future studies could explore essential components of education that contribute to improved sleep health.

LBA 1580

Mouse Bio-Behavioural Phenotyping: Using the "Digital Homecage" for Long-Timescale, High Resolution, Multi-Factor Recording of Homecage Sleep and Wake

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Introduction: Long-term behavioural monitoring is crucial for understanding chronic brain disorders, including circadian and stress-related conditions. Traditional short-term behavioral tests often fail to capture these phenomena due to adaptation and stress factors. Digital Homecage monitoring in rodents can provide continuous behavioural data, similar to "digital phenotyping" used in humans.

Methods: We developed the Digital Homecage (DHC), a low-cost, open-source system designed to collect 20+ metrics, focusing on behavioural patterns in single-housed C57BL/6J mice. The system integrates video, operant, and wheel-running data recorded continuously at sub-second resolution, measuring sleep, actigraphy, voluntary exercise, grooming, and more. The results presented here are the baseline 4-week analysis of the DHC prior to experimental interventions done in December 2024, allowing us a new data stream to analyze for late-breaking submission.

Results: Using 16 fully operational DHC units, we recorded 16 mice over a 4-week period. Sleep was the most frequently observed behaviour, accounting for 43.19% of daily behaviour, While most behaviours occurred during the dark (active) phase, "Sleep" and additionally "Twitch" occurred during the light (inactive) phase (ZT4.50±0.22 and ZT4.99±0.24, respectively). This is of note as twitches are often associated with REM sleep or seep more generally. This data reveals circadian modulation consistent with nocturnal patterns. Body weight remained stable after an initial brief decrease, demonstrating the system's non-intrusive nature on stress and well-being. The system further verified overall preference for 1% sucrose (13.93±1.14 pokes per hour compared to regular water [2.78±0.31], regular food [4.08±0.45], and fatty food [3.91±0.53], $p<0.001$), data which stood regardless of food water choice and feeder position randomization. Further data including actigraphy, wheel running, and food preference are also noted during active hours.

Conclusion: The DHC offers detailed measures of long-term sleep behaviours and circadian dynamics in mice, providing a reliable tool for longitudinal studies of sleep and circadian-related disorders. Its open-source nature encourages community collaboration and potential integration with physiological monitoring to advance research on brain-

behaviour relationships. The system's capacity for detailed behavioural phenotyping makes it ideal for future explorations in sleep and related research.

Support: This work was supported by the NIH (MH107662) and the Pritzker Neuropsychiatric Research Consortium.

LBA 1581

One-Week of Effective CPAP Treatment Increases the Release of the Incretin Hormone GIP in Patients with OSA and Comorbid Diabetes

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Introduction: Glucose-dependent Insulinotropic Peptide (GIP) and Glucagon-Like Peptide-1 (GLP-1) are two incretin hormones, co-released by the gut, that enhance insulin secretion and satiety after oral carbohydrate intake. One-year treatment with the dual GLP-1/GIP receptor agonist tirzepatide can reduce weight by 15-20%. On December 20, 2024, tirzepatide became the first FDA-approved drug for the treatment of OSA. In the supporting clinical trials, significant weight loss markedly improved but did not consistently eliminate OSA. A beneficial impact on OSA has not been reported for single GLP-1 receptor agonists, raising the possibility that GIP receptor agonism might help decrease OSA severity beyond weight loss alone. In this context, we report data on the relationship between OSA and GIP independent of weight loss in obese/overweight adults with type 2 diabetes (T2DM) and OSA.

Methods: Participants (n=9; Age: 54.0±3.2 years, BMI: 38.2±3.2 kg/m^2, HbA1c: 7.6±0.6 %, screening AHI: 44.7±6.1/hour) participated in a proof-of-concept study on the metabolic and hormonal effects of one week of fully compliant CPAP. The protocol involved two 28-h inpatient admissions separated by 7 consecutive nights of 8-h supervised CPAP use in the research sleep laboratory. Body weight, habitual lifestyle, and medications remained unchanged. Before and after CPAP treatment, participants underwent 24-hour blood sampling every 15-30 minutes while consuming identical high-carb meals (morning, midday, evening). Glucose, insulin, norepinephrine and GIP levels were assayed on each sample, and the change pre- to post-CPAP treatment was analyzed.

Results: Mean±SEM nightly CPAP use was 7.92±0.08 h. Average AHI reduction was 33.8±8.1 events/h. Mean 24-h glucose levels reduction was 12.0±4.3 mg/dl ($p<0.01$) without change in insulin levels. GIP levels increased during the daytime period (100.9±9.0 versus 83.9±6.5 pg/ml, $p<0.01$) but not during the overnight fast (29±3.5 vs 28±2.6 pg/ml). Post-prandial GIP increase was associated with decreased norepinephrine levels.

Conclusion: Findings suggest that OSA impairs post-prandial GIP release, negatively affecting glycemic control in T2DM. One week of effective CPAP therapy can enhance the GIP response even when weight is stable. In patients under incretin therapy for obesity with comorbid OSA, continued CPAP therapy may facilitate weight loss.

Support: Investigator-Initiated Grant from Philips/Respironics

LBA 1582

Effectiveness of a Single Shot Telehealth Treatment in Reducing Insomnia and Depressive Symptom Severity

Authors: Izza Peeran, Marleigh Treger, Anthony Reffi, Matthew Jennings, Cynthia Fellman-Couture, Christopher Drake, Jason Ellis, Philip Cheng

Introduction: Insomnia and depression are highly comorbid and significantly impact mental health. Research has shown that treating insomnia not only reduces concurrent depression but can also reduce incidence of future depressive episodes by 50%. One way to further augment this effect may be to move upstream and prevent the development of insomnia disorder. This study aimed to evaluate the efficacy of a single-session telehealth intervention on insomnia and depressive symptom severity over 12 months.

Methods: A total of 167 participants with prodromal insomnia were randomly assigned to either preventative CBT-I group (pCBT-I; n = 82) or a sleep education control (n = 85). Prodromal insomnia was operationalized as symptoms that do not yet meet diagnostic criteria for insomnia disorder. pCBT-I comprised a 60-minute telehealth session focused on sleep restriction, stimulus control, cognitive control, and imagery distraction. The control group received digital sleep hygiene education. Insomnia and depression severity were assessed using the Insomnia Severity Index (ISI) and Quick Inventory of Depressive Symptomatology (QIDS) at baseline, one-month post-treatment, and at one-year follow-up. Pre-post changes were calculated by subtracting baseline scores from those at one-month post-treatment and one-year follow-up. The final point of data collection occurred on 02/22/2025.

Results: The single-session pCBT-I intervention showed greater acute post-treatment reductions of insomnia severity compared to the SE group, $t(127) = 4.40$, $p < 0.001$. This effect remained significant at one-year follow-up, $t(127) = 3.02$, $p = .003$. In contrast, the acute post-treatment changes in depression severity were not statistically significant, $t(115) = 1.55$, $p = 0.12$; however, those in the pCBT-I group showed smaller increases in depression severity at one-year follow-up compared to the SE group, $t(115) = 2.0$, $p = .05$.

Conclusion: These findings provide strong preliminary evidence for the efficacy of a single shot pCBT-I when implemented during the prodromal phase of insomnia disorder. Specifically, pCBT-I had strong efficacy for sustained reduction of pre-clinical insomnia severity and prevented increases in depression severity at one-year post-treatment.

LBA 1583

Association of Sleep Quality with Asthma Control and Asthma Severity

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Introduction: Asthma control is a major management problem. Pathologic features like bronchial obstruction deteriorate sleep. Asthma is interconnected with lower health-related quality of life and poor sleep. Sleep disturbance detection and monitoring can help to manage asthma. Asthma is related to comorbidities like obesity, obstructive sleep apnea (OSA), and gastroesophageal reflux diseases (GERD), and reciprocity between these comorbidities is not fully understood. There is a limited study about the sleep quality of asthmatics in the Indian population.

Methods: In a cross-sectional study until March 2025, we included voluntary subjects as normal control (NC); known asthmatics subjects were included from the Pulmonary Medicine department. Asthmatic subjects were categorized as having either non-severe asthma (NSA) or severe asthma (SA), according to the American Thoracic Society's definition of refractory asthma. We assessed sleep quality using the Pittsburgh Sleep Quality Index (PSQI) and daytime sleepiness using the Epworth Sleepiness Scale (ESS) questionnaire. FEV1 prebronchodilator were recorded by spirometry. The questionnaires on asthma control and gastroesophageal reflux disease (GERD) impact scale and the sleep apnea scale of the sleep disorders were filled out with informed consent.

Results: We included 45 normal controls and 45 asthmatic subjects. One asthmatic subject was found to be at high risk for gastroesophageal reflux disease, so one subject was separately noted for further exclusion in part of the analysis. Over 36.36% NSA,35.29% SA, and 8.6% normal control reported having hypertension. The correlation between sleep quality and ESS code was significant. Poor sleep quality was associated with excessive sleepiness ($r=0.31$, $p<0.05$). ACQ code was significantly correlated with sleep quality ($r=0.47$, $p<0.001$) and ESS code ($r=0.36$, $p<0.05$). Well-controlled asthma was associated with good sleep quality; the subjects were unlikely to be abnormally sleepy. The association between PSQI code and asthma severity was not significant.

Conclusion: Poor sleep quality was associated with not well-controlled asthma. Identifying modifiable risk factors such as sleep can help better manage asthma.

LBA 1584

Active Consolidation or Passive Protection? The Effects of a Midday Nap on Declarative and Procedural Memory

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Introduction: Previous studies have shown that short naps play a positive role in preserving learned information. However, whether this benefit arises from active consolidation or passive protection against interference remains debated.

Methods: We recruited 39 healthy habitual nappers to examine the effects of different types of rest (i.e., a 90-minute nap, quiet rest, and active wakefulness) on the consolidation of declarative and procedural memory. Participants completed an encoding task upon arrival, followed by a post-rest test after different rest conditions and a post-interference test after the same interference task. Data analysis and key findings were completed between December 2024 and March 2025.

Results: Results indicated that while declarative memory accuracy significantly declined from pre-test to post-rest and further to post-interference in both quiet rest and active wakefulness groups, memory performance remained stable in the nap group. For procedural memory, no significant interaction effects between group and time were observed; however, a significant main effect of time indicated improved accuracy and speed following all rest groups. Spectral analysis of REM sleep revealed that delta and theta power positively correlated with procedural memory accuracy and speed. No significant associations were found between other sleep characteristics and memory performance.

Conclusions: These findings suggest that while napping protects declarative memory, the underlying neural mechanisms remain unclear. Additionally, REM sleep appears to facilitate procedural memory, yet the relatively short REM duration in naps may limit its observable effects on procedural memory performance.

LBA 1585

Spindle Trains and Slow Oscillation Coupling Facilitate Declarative Memory Reactivation During Sleep: Evidence from Multivariate Pattern Analysis

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Introduction: Endogenous memory reactivation during sleep is one of the mechanisms proposed to explain sleep-related memory consolidation. Given the challenges posed by the direct monitoring of this process during sleep in humans, most research to date yielded a range of correlational findings linking different sleep characteristics (such as slow-oscillations [SO], spindles, etc.) to memory consolidation. Here, we aim to (1) provide direct evidence of memory reactivation during sleep spindles by applying multivariate pattern analysis (MVPA) with simultaneous electroencephalographic and functional magnetic resonance imaging (EEG-fMRI), (2) identify the underlying neural networks, and (3) determine which spindle subtypes contribute most to this process.

Methods: Twenty-four adults learned the locations of human faces and scenes within a rectangular matrix. On Day 1, participants learned one of the two stimulus categories (A) and then slept in the MR scanner while EEG-fMRI was recorded. Memory retention was assessed using cued recall before and after sleep. On Day 2, participants learned the other category (B) and completed a MVPA localizer task involving both categories, which was used to train a binary classifier. Sleep fMRI data were used to assess memory reactivation, with each fMRI volume being classified as either category-A or B memory patterns, and reactivation effect was quantified as percentage of category-A prediction. Sleep stages, spindles and slow oscillations were extracted from EEG data. The spindles were then categorized as being isolated vs. trains (< 6s apart), fast vs slow and coupled vs. uncoupled with SO. Pearson correlations were used to assess the relationship between memory reactivation during spindle events and behavioral memory retention performance.

Results: The neural pattern corresponding to the pre-sleep learned image category was significantly reactivated during N2 sleep and sleep spindles, primarily within the memory retrieval networks. Spindle-locked memory reactivations correlated positively with post-sleep declarative memory performance. Moreover, spindles occurring in trains or coupled with SO presented a higher memory reactivation effect.

Conclusion: Our results reveal that the MVPA approach was successful in: 1) demonstrating that spindles, especially those grouped in trains or coupled with SO, are associated with memory reactivation, and 2) identifying the neural network underlying the consolidation process.

LBA 1586

Bedtime Stories: Sleep Health Education for Pediatric Providers in Community Settings

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Introduction: Pediatric providers can be a first line of defense in promoting sleep practices. However, without guidelines and recommendations, many providers have limited training to adequately implement basic practices for healthy sleep. Furthermore, anticipatory guidance on healthy sleep for school-aged children remains scarce and could contribute to sleep health inequities in communities who disproportionality experiences poor sleep. This study aimed to develop a sleep health education course for pediatric providers and examine providers' knowledge and practices of sleep health principles.

Methods: Pediatric providers, residents, and nurse practitioners were recruited from two large hospital-affiliated centers in Boston. Participants received a personalized link to enroll in the self-paced online course which includes six required modules (Basics of Sleep, Sleep and Development, Sleep Health, Consequences of Insufficient Sleep, Sleep Health Disparities, Screening and Referral) and one optional module (Melatonin). All participants completed a course evaluation, a retrospective pretest-posttest survey examining knowledge and intent to change practice, by indicating their level of agreement with each statement before and after the course using a five-point Likert-type scale (1-strongly disagree; 5-strongly agree). Participants received continuing medical education credit and a gift card.

Results: Data collected (December 2024 to March 2025), include 30 consented participants, of which: 10 in-progress, 4 not started, and 16 completed. Course completers (15 MD, 1 nurse practitioner) were on average 35.9 years of age (range= 26-34), primarily female (90%), majority white (79%) non-Hispanic (90%) with an average of 8.6 years (range= 0.5 - 30) of experience. The retrospective pre-test indicators revealed that participants experienced a positive change in knowledge with the overall mean for the six knowledge areas increased from 2.8 (before) to 4.1 (after) ($p < 0.001$). An overwhelming majority (14, 88%) said this course changed their practice. Topics providers rated most highly were: basics of sleep, sleep and development, and screening and referral.

Conclusion: The results suggest that knowledge among pediatric professionals could be improved through a short educational course. This improvement not only highlights the course's effectiveness but also suggests that similar educational interventions could play a crucial role in enhancing pediatric sleep practices on a wider scale.

Support: Allan and Gill Gray Foundation

LBA 1587

Increased Lung-to-Finger Circulation Time is Associated with Severe Hypoxic Load in Patients with Obstructive Sleep Apnea

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Introduction: The lung-to-finger circulation time (LFCt), a marker for cardiac output, is defined as the period from the offset of a respiratory event to the nadir of the following oxygen desaturation (SpO_2) event. Furthermore, the OSA-induced hypoxic load is a significant contributor to cardiovascular comorbidities. However, the link between LFCt and respiratory events, following hypoxemia events in OSA patients, is still unexplored. Therefore, this study aims to investigate the connections between LFCt and hypoxic load, potentially providing novel information that eventually contributes to understanding physiological stress in OSA patients.

Methods: The study consists of 69559 respiratory events, following hypoxemia events, collected from 878 in-lab PSGs of suspected OSA patients. First, the conventional OSA metrics and SpO_2-based metrics were computed. Then, the data was divided into quartiles (Q1-Q4) based on respiratory event duration and further divided into sub-quartiles based on LFCt. The empirical cumulative distribution functions (CDFs) and regression models were used to investigate the association between hypoxic load metrics and LFCt.

Results: The hypoxic load elevated significantly with increased LFCt in respiratory event-based quartiles. This relationship remained constant with the LFCt-based sub-quartiles and CDFs as well, i.e., the hypoxic load elevated significantly with prolonged LFCt despite the type or length of respiratory events. The desaturation fall duration was significantly longer in patients with prolonged LFCt (Q1-FallDur:14.6s; Q4-FallDur:29.8s; p<**0.0001**). The regression models also agreed on the association between hypoxic load and LFCt; the 10% decrease in fall slope significantly prolonged LFCt up to 6.17 seconds (Q1-FallSlope: β = -3.224; Q4-FallSlope: β = -6.178; p<**0.0001**). The results were found in February 2024.

Conclusion: These SpO_2-based hypoxic load metrics, including LFCt, might help estimate the physiological consequences of respiratory and following hypoxemia events. Therefore,

including these metrics in diagnosing the severity of OSA might enhance the assessment of OSA.

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LBA 1588

Exacerbated Neuroinflammation due to Vagus Nerve Stimulation (VNS) During Acute Sleep Deprivation (SD): Evidence from a Rodent Model of VNS to Augment SD-Induced Performance Decrements

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Introduction: Cognitive decrements from sleep deprivation (SD) among demanding positions, such as military Warfighters and first responders, increases risk to performance and mission outcomes. Non-invasive neuromodulation techniques have gained popularity for their performance augmentation potential. Vagus nerve stimulation (VNS) can improve cognitive performance in healthy and sleep deprived individuals, albeit there are conflicting reports. Although VNS is widely considered safe, neurophysiological consequences of VNS during SD are not known. Here, we present late-breaking biomolecular results analyzed December 2024 from an in vivo preclinical VNS model in SD rats.

Methods: Animal activities were IACUC protocol approved. Platinum/iridium electrode cuffs were implanted around the unsheathed left vagus nerve of healthy male Sprague-Dawley rats (N=60) aged 10-12 weeks. After recovery from surgery, animals underwent 120 h continuous SD using a modified disk-over-water paradigm. Paired with cognitive neurobehavior (data not presented), VNS was administered as fifteen 100 μs biphasic pulses at 30 Hz, 0.8 mA constant current every 18 seconds for 30 minutes for 4 consecutive days. SHAM animals underwent VNS surgery, but did not receive stimulation. Following humane euthanasia, hippocampus (HC) and prefrontal cortex (PFC) tissue were analyzed for cytokines and chemokines using an enzyme-linked immunosorbent assay (n=8-13).

Results: There was a trending increase in interleukin-10 (IL-10, $p=0.07$) and chemokine CXC motif ligand 1 (CXCL1, $p=0.09$) in the HC after SD. However, animals who received VNS during SD (VNS+SD) had significant CXCL1 increases in the HC ($p=0.001$) and PFC ($p=0.03$) compared to SHAM controls. VNS+SD had trending increases in IL-6 ($p=0.05$) and interferon-γ (IFN-γ, $p=0.06$) in the HC. SD alone or combined with VNS did not change HC IL-1β, IL-4, IL-5, and IL-13 or PFC IL-1β, IL-4, IL-5, IL-6, IL-10, IL-13, and IFN-γ.

Conclusion: Although VNS and other neuromodulation techniques may be helpful countermeasures for SD-induced cognitive decrements and risk mitigation, our results suggest VNS applied during SD increases neuroinflammation. Sustained neuroinflammation is associated with neurological impairment and neurodegeneration. Although neurostimulation may successfully augment performance, more research is needed to ensure these countermeasures do not contribute to long-term negative health effects. No DoD endorsement implied.

Support: Navy BUMED Program of Record for Toxicology

LBA 1589

Use of Hip-Worn Accelerometers to Assess Sleep Duration and Sleep Midpoint

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Introduction: Evaluating rare health outcomes associated with sleep is difficult due to long latency periods. Case-control studies have historically been utilized, but recalling past sleep can be difficult, while prospective studies may not have historically collected sleep data. Several studies have used hip-worn accelerometers to study physical activity(PA). To investigate if this data is a valid method to measure sleep patterns, we compared estimated sleep duration and midpoint based on hip-worn accelerometer non-wear time against sleep diaries.

Methods: In 2022-2024, 23,111 participants (mean age 58 years, SD 9.8) of the American Cancer Society Cancer Prevention Study-3 were enrolled in a week-long, hip-worn accelerometry study and asked to fill out sleep diaries. Standard PA accelerometry protocols were used; participants were instructed to wear the accelerometer while awake and to take them off prior to bed. A sleep period was captured if a participant followed protocols on consecutive days (e.g. valid wear on Monday and Tuesday corresponded to Monday night sleep). Between 2/4/25-3/14/25, we evaluated data from 1878 participants with 7 complete days of wear (corresponding to 6 nights). We used Bland-Altman plots to compare sleep duration and midpoint calculated from accelerometer non-wear periods to sleep diary.

Results: On weekday nights, the mean difference between non-wear duration and sleep diary duration was +25.6 minutes (weekend: +24.1 minutes). The range in differences varied from +27.0 minutes Thursday night to +23.6 minutes Saturday night. Sleep midpoint was 2.09 minutes later compared to diary on weekdays and 1.85 minutes later on weekends (range +4.0 minutes Thursday night, -0.3 minutes Sunday night).
Conclusion: Unsurprisingly, sleep duration was overestimated based on non-wear of hip accelerometry compared to diary, but by less than half an hour. Day-to-day variation was consistent across the week, suggesting that these data can evaluate relative changes in sleep duration. Midpoint based on non-wear time provided accurate estimates. Overall, non-wear time of hip accelerometers can be used to estimate sleep duration and midpoint.

Support: The American Cancer Society funds the creation, maintenance, and updating of the Cancer Prevention Study-3 cohort. This analysis was also supported through an unrestricted research grant from Sleep Number Corporation.

LBA 1590

Predicting Upper Airway Obstructive Pattern via Acoustic Analysis of Snoring Sounds

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Introduction: The aim of this study is to develop and validate a method for predicting drug-induced sleep endoscopy (DISE) findings in patients with obstructive sleep apnea (OSA) from an acoustic analysis of their snoring sounds obtained using a novel recording method.

Methods: This is a prospective study of adult patients diagnosed with OSA undergoing DISE at a single tertiary care medical center. Snoring sounds were recorded during DISE using a digital stethoscope. The audio files were processed to remove excess noise, and 6,373 acoustic features were extracted from each recording using the OpenSMILE package in Python. A support vector machine (SVM) model was developed using the top 100 acoustic features ranked by a mixed redundancy maximum relevance (mRMR) algorithm to predict the location and pattern of obstruction observed during DISE.

Results: 98 patients met criteria for inclusion between November 2019 and January 2025. The mean recording duration was 216 seconds and included 25.3 snore events/patient. The subjects were divided into four primary obstructive locations, including palatal (n = 40), oropharyngeal (OP; n = 8), tongue base (BOT; n = 18), and multilevel obstruction (n = 32). Subjects were also classified by obstructive pattern, including anteroposterior (AP; n = 66) and circumferential or lateral collapse (CL; n = 32). Obstructive location and pattern were then combined into four categories, including palatal-AP (n = 48), palatal-CL (n = 22), BOT-AP (n = 18), and BOT-CL (n = 10). The model achieved an accuracy of 73% for predicting the location of obstruction, 93% for predicting the pattern of obstruction, and 80% for predicting combinations of obstructive location and pattern.

Conclusion: Machine learning assisted analysis of snoring sounds offers a promising method of predicting the pattern of obstruction in patients with OSA. With continued refinement, this approach may offer the potential to guide surgical decision making without the need for DISE evaluation.

Support: None

LBA 1591

A Randomized Cross-Over Trial of an Interactive Sleep Sound Analysis Smartphone Application Versus STOP-BANG Questionnaire to Screen for Obstructive Sleep Apnea Among Community-Dwelling Chinese Adults with Hypertension

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Introduction: Obstructive sleep apnea (OSA) is an extremely prevalent yet frequently undiagnosed risk factor for hypertension and its complications. This study aims to compare the validity and feasibility of home OSA screening among Chinese community-dwelling adults with hypertension using a smartphone application (Snail Sleep) that applies machine learning algorithms to classify sounds like snoring, sleep apnea, and breathing and generate an interactive individualized sleep apnea risk assessment report versus the STOP-BANG Questionnaire and examine the impact of screening on patient motivation for diagnosis and treatment.

Methods: An ongoing randomized cross-over trial (anticipated completion May 2025) recruited community-dwelling adults with hypertension in Haikou, China, to randomly undergo sequential OSA screening using either STOP-BANG Questionnaire (SBQ) or overnight home-based screening using a smartphone application generating an obstructive apnea index (OAI). Participants underwent confirmatory home sleep apnea testing, scored by blinded assessors. Questionnaires measured participant satisfaction and motivation to pursue further diagnosis and treatment.

Results: Interim data from 131 adults with hypertension (median age: 52 years, 73% male) is reported. The prevalence of OSA was 122/131 (93.1%), including 29.0% mild (AHI 5-14.9), 29.8% moderate (AHI 15-29.9), and 34.4% severe (AHI ≥30). An obstructive apnea index (OAI) ≥5 demonstrated a sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of 58.2%, 88.9%, 98.6%, and 13.6%, respectively, for OSA (AHI ≥5) and a sensitivity, specificity, PPV and NPV of 73.8%, 78.7%, 86.1%, and 62.7%, respectively, for moderate-to-severe OSA (AHI ≥15). A STOP-BANG score of ≥3 demonstrated a sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of 89.3%, 22.2%, 94.0%, and 13.3%, respectively, for OSA (AHI ≥5) and a sensitivity, specificity, PPV and NPV of 95.2%, 21.3%, 68.4%, and 71.4%, respectively, for moderate-to-severe OSA (AHI ≥15). No significant difference was found regarding motivation to pursue diagnosis and treatment in either the smartphone app (p=0.0508) or SBQ group (p=0.5695). Mean satisfaction level was 4.1 out of 5.

Conclusion: A sound analysis smartphone app demonstrates favorable feasibility and validity for OSA screening among Chinese adults with hypertension as compared to the STOP-BANG questionnaire.

Support: This study was funded by Seblong Technology, Beijing, China.

LBA 1592

A Wearable Integrated Sleep Diary Ecosystem Improves Sleep Measurement

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Introduction: Accurate measurement of sleep metrics, such as sleep onset latency (SOL) and total sleep time (TST), remains a significant challenge. Discrepancies between sleep metrics derived from sleep diaries and wearable devices are well-documented, particularly in clinical populations. These inconsistencies complicate data interpretation and may hinder the development of effective interventions. Despite these limitations, sleep diary data remains the standard, which may reduce clinical trial sensitivity and obscure meaningful effects. Reconciling data from different measurement approaches is essential to advancing sleep research and clinical practice.

This study examined whether providing wearable device data feedback during sleep diary completion would improve agreement between subjective and objective measures in healthy sleepers and individuals with insomnia. We hypothesized that delivering wearable device data feedback would reduce bias and limits of agreement, as assessed by Bland-Altman analysis, compared to a control diary without feedback.

Methods: We employed a three-phase, randomized, crossover design with adults with insomnia (N = 39, verified by semi-structured clinical sleep interview) and healthy sleeping controls (N = 23), mean age 30.8 (SD 16.2), 69% non-white, and 41% female. Participants completed week-long periods of a control condition (digital sleep diary without device data feedback), a washout phase, and a test phase (diary with device feedback). The order of conditions was randomized. The final participant completed data collection in March of 2025.

Results: As predicted, the test diary reduced bias and limits of agreement for SOL and TST compared to the control diary. In the insomnia group, SOL bias decreased from -9.1 to -2.6 minutes, with limits of agreement reduced by 89.2 minutes. TST bias decreased from 35.64 to 13.1 minutes, with limits of agreement reduced by 91.6 minutes. Among healthy sleepers, SOL bias decreased from -12.6 to -6.3 minutes, and limits of agreement were reduced by 68.6 minutes. TST bias decreased from 50.3 to 27.5 minutes, with limits of agreement reduced by 91.2 minutes.

Conclusion: Integrating wearable device data into sleep diary completion improves the accuracy of self-reported sleep metrics, reducing bias and narrowing limits of agreement in

insomnia and healthy groups. This integration bridges measurement gaps, offering a promising approach for enhancing the precision of sleep diaries and improving clinical decision-making.

Support: This study was supported by a Small Business Innovation Research Grant from the National Health Lung and Blood Institute

LBA 1593

Positive Airway Pressure Therapy Adherence in Adults with Epilepsy and Obstructive Sleep Apnea

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Introduction: Untreated obstructive sleep apnea (OSA) can negatively impact epilepsy outcomes. OSA treatment reduces seizures and improves quality of life in adults with epilepsy (AWE). Prior studies lack PAP adherence data. We leveraged a polysomnographic (PSG) database to explore PAP adherence in relation to outcomes in AWE.

Methods: Among 197 AWE with PSG data, 122(61.9%) had OSA (AHI ≥5). Of these, 73(59.8%) were prescribed PAP therapy. Demographics, epilepsy variables (type, seizure frequency, antiseizure medication (ASM) standardized dose), seizure outcomes (≥50% seizure reduction and successful outcome (ongoing seizure freedom if seizure-free at baseline)), and subjective and objective PAP adherence (data available 1/25/2025) were collected at baseline and after ≥ 1yr follow-up. Adherence was defined as use ≥4 hours ≥70% of nights over ≥30 days. Fisher's exact test studied the relationship between adherence and seizure outcomes. Raw agreement between subjective and objective data was estimated with confidence intervals.

Results: 73 AWE with OSA prescribed PAP were included (age 47.6±13.8,43.8% female, BMI 34.6±8.1 kg/m2,76.4% Caucasian). Focal epilepsy constituted 71.2% with monthly seizure frequency (excluding auras) 0.00 [0.00,2.0], and ASM standardized dose 1.4[1.00,2.7]. 62(84.9%) had successful seizure outcome. 19(63.3%) with baseline seizures achieved ≥50% seizure reduction. Subjective adherence was available in 69(94.5%) and objective in 25(34.2%) at follow-up (duration 5.0 yrs ± 3.2 yrs). Baseline demographic, epilepsy-related, and seizure outcome data were similar in the overall and PAP adherence data subset. Subjective adherence was achieved in 41(59.4%) and objective in 15(60.0%). Agreement between subjective and objective adherence (based on N=10) was 0.50 (0.19,0.81). Objective adherence improved from 44.4% to 68.8% from 1-yr to last follow-up. In patients with available objective adherence data who were fully adherent to PAP therapy (N=15), 14(93.3%) achieved a successful outcome; in those with baseline seizures (N=5), 4(80.0%) achieved ≥50% seizure reduction.

Conclusion: Despite the small sample, this is the largest known sample of PAP adherence and seizure outcomes in AWE. Adherence increased from 1-yr to last follow-up. Seizure outcomes were favorable in most objectively adherent AWE. Given the high prevalence of OSA and ASM resistance, further studies exploring outcomes of PAP therapy in AWE are warranted.

LBA 1594

Sleep Patterns of Formerly Incarcerated Individuals with Cardiovascular Risk: Insights from the Sleep Justice Study

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Introduction: Approximately 2 million people are incarcerated in the U.S. and a quarter of adults have criminal legal system involvement. Prisons and jails have unique social and physical environments that impair sleep; however, sleep health remains underexplored in this population.

Methods: The Sleep Justice study described sleep patterns in 254 individuals with cardiovascular risk factors returning home from the Connecticut Department of Correction (1/2019-3/2025). Sleep was assessed using validated surveys: sleep quality (Pittsburgh Sleep Quality Index), sleep apnea risk (STOP-Bang), and sleep control (Brief Index of Sleep Control). Sociodemographics, criminal legal system exposure, psychosocial factors, and chronic health conditions were also captured. Latent class analysis identified sleep phenotypes and bivariate analysis selected covariates for a multinomial logistic regression model with sleep phenotypes as the outcome and best sleep as the reference.

Results: Among 254 participants (mean age = 45, SD = 10.7 years; 226/89% male; 107/42% non-Hispanic Black; 84/33% Hispanic), four distinct sleep phenotypes emerged: good quality sleep with high control (class 1, n = 94/37%), moderate sleep with high control (class 2, n = 45/18%), poor sleep with increased obstructive sleep apnea risk and some control (class 3, n = 35/14%), and worst sleep with insomnia, daytime dysfunction, and low control (class 4, n = 80/31%). Multinomial logistic regression revealed that the Patient Health Questionnaire (PHQ-9) was associated with poor sleep phenotypes, with class 3 (OR = 1.43, 95% CI: 1.07–1.90, p = 0.015) and class 4 (OR = 1.47, 95% CI: 1.15–1.89, p = 0.002). Total lifetime adversity score was also linked to Class 3 (OR = 1.35, 95% CI: 1.07–1.71, p = 0.010) and Class 4 (OR = 1.26, 95% CI: 1.04–1.52, p = 0.017). By contrast, self-efficacy was protective and associated with moderately good sleep (class 2: OR = 1.53, 95% CI: 1.10–2.12, p = 0.011).

Conclusion: With high incarceration rates in the U.S. disproportionately affecting racial and ethnic minoritized groups, understanding post-release sleep health is crucial. This study is the first to explore sleep patterns after incarceration, emphasizing the need for targeted sleep interventions in this population.

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LBA 1595

Engaging Primary Care Providers and Older Adults in Refining and Scaling a Novel Model of Insomnia Assessment and Treatment

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Introduction: Chronic insomnia impacts nearly two-thirds of older adults, contributing to negative consequences if untreated. Despite validated screening measures and gold-standard treatments (e.g., CBTI), insomnia remains largely overlooked in primary care. Identifying barriers and facilitators in the refinement and scale-up of effective care models for chronic insomnia among older primary care patients is warranted.

Methods: Guided by principles of implementation science, our team collaborated with five primary care clinics belonging to a multistate healthcare system to engage in a multi-step process exploring current practices and preferences related to sleep assessment and treatment for older adults. In Phase I (8/2023 – 5/2024), a convergent mixed methods design captured quantitative surveys and qualitative interviews from each older adults (OA) and primary care providers (PCP). In Phase II (6/2024 – 3/2025), follow-up surveys and co-design sessions were conducted with OAs and PCPs to refine the proposed care model. Descriptive statistics and thematic coding were used for analysis.

Results: Patient surveys (N=446) indicated a high prevalence yet underdiagnosis of chronic insomnia (N=117; age, mean(SD)=73.9(6.8), 66% Female, 21% Black, 22% frail, 23% poor health, 38% EHR-documented insomnia diagnosis). Provider surveys (N=25) indicated regular screening for sleep problems (N=16[64%]), yet, only one-third use validated screeners. PCPs cited lack of brief sleep screeners and/or resources for patients with sleep problems (N=10[40%]) as common barriers. PCPs were more confident screening for sleep apnea than insomnia (72% vs. 52%). PCPs' current insomnia practices included: sleep hygiene recommendations (N=18[72%]), adjusting sleep-impacting medications (N=13[52%]), and pharmacotherapy for insomnia (N=8[32]%). Co-design sessions (8 sessions total; OA(N)=5, PCP(N)=6) proposed a multi-step care model consisting of age-friendly sleep tips, self-guided CBTI, self-guided CBTI plus provider support, group-based CBTI, and individual CBTI. OAs and PCPs agreed sleep screening should occur via the patient portal prior to a Medicare Annual Wellness Visit. PCPs felt patients should choose their treatment; OAs indicated no preference other than preferring behavioral options over pharmacotherapy (67% vs. 35%).

Conclusion: PCPs expressed a strong desire for additional insomnia treatment options. Adopting a multi-step model may enhance patient access to evidence-based insomnia care in a feasible, scalable, and cost-effective manner.

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LBA 1596

Bed-Sharing Does Not Impact Rest/Activity Cycle in 6-Month-Old Infants: New Data from a Brazilian Birth Cohort

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Introduction: Bed-sharing remains a common yet controversial infant sleep practice worldwide. While frequently debated regarding safety, its potential effects on circadian rhythms remain poorly understood. This study examines whether bed-sharing relates to rest/activity cycle in infants. Data were collected between January-December 2024 as part of an ongoing Brazilian birth cohort.

Methods: We analyzed continuous 7-day ankle actigraphy data from 194 healthy 6-month-old infants (56.2% male) from the Ribeirão Preto Birth Cohort. Analysis compared non-bed-sharing (Never/Occasional, n=95, 48.97%) versus bed-sharing (Frequent/Always, n=99, 51.03%) groups. Five non-parametric circadian variables were computed: Intradaily Variability (IV), Interdaily Stability (IS), least active 5-hours (L5), most active 10-hours (M10), Relative Amplitude (RA). Mann-Whitney tests with False Discovery Rate correction were applied.

Results: Data analyzed in February 2025 revealed no statistically significant differences between bed-sharing and non-bed-sharing groups across all five circadian metrics after FDR correction (all $p>0.74$). Median values were remarkably similar between groups for rhythm fragmentation (IV: 0.9607 vs. 0.9713), stability (IS: 0.4593 vs. 0.4697), nighttime activity (L5: 236.0296 vs. 225.4550), daytime activity (M10: 3179.1986 vs. 3351.8801), and amplitude (RA: 0.8609 vs. 0.8595).

Conclusion: These findings suggest that bed-sharing itself may not significantly impact the rest/activity cycle in 6-month-old infants. This relatively large sample of rest/activity cycle data obtained from actigraphy provides new insights into an area where objective data is scarce.

Support: Research funded by FAPESP and CAPES.

LBA 1597

Beyond CPAP Downloads: The Role of Effective AHI in Evaluating Treatment Burden

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Introduction: The Apnea-Hypopnea index (AHI) obtained from continuous positive airway pressure (CPAP) downloads is the standard measure of OSA treatment efficacy, but does not include respiratory events occurring during sleep periods where CPAP is not used. This study aims to assess the validity and utility of calculating the effective AHI (eAHI) using data from actigraphy and CPAP downloads compared to a home sleep test.

Methods: We analyzed existing data from 15 OSA patients (mean age 50 years, BMI 32.2kg/m2 and baseline AHI of 5.6-95.9/hour) who were treated with either oral appliance therapy (OAT) or CPAP with optimal adherence. Total sleep time ($TST_{Actigraphy}$) was assessed before and on treatment using 7-day actigraphy. Adherence to therapy was determined from CPAP download data or a chip embedded in the OAT. Baseline diagnostic $AHI_{WatchPAT}$ was obtained from a WatchPAT home sleep test (HST); residual $AHI_{WatchPAT}$ was similarly obtained on treatment over the entire sleep period. Residual AHI_{CPAP} was obtained from CPAP download reports. eAHI was calculated using the equation: eAHI = max(1, Adherence/$TST_{Actigraphy}$) x Residual AHI + min(0, Non-adherence/$TST_{Actigraphy}$) x Diagnostic $AHI_{WatchPAT}$. We then applied this equation to a second cohort of patients (n=25, mean age 64 years, BMI 32.5kg/m2 and AHI of 17.6-97.5/hour) on CPAP who had varying levels of adherence (range 1.12-7.85 hours per night; 21%-100% of $TST_{Actigraphy}$).

Results: $TST_{Actigraphy}$ showed no significant difference before and on treatment (6.29**±1.04 hours vs 6.49±0.72 hours, p=0.36). In the 15 patients with optimal adherence, eAHI calculated using pre-treatment $TST_{Actigraphy}$ was not significantly different to residual** $AHI_{WatchPAT}$ (4.85 vs 4.45, p=0.33). eAHI calculated using on-treatment $TST_{Actigraphy}$, pre-treatment time in bed ($TIB_{Actigraphy}$), and on-treatment $TIB_{Actigraphy}$, showed similar results. In the 25 patients with suboptimal adherence and residual AHI_{CPAP} of 3.6/hr, average eAHI was 10.2/hr; difference was 6.72/hr (0-22.84).

Conclusion: Our study shows that actigraphic sleep time remains unchanged with treatment, suggesting pre-treatment sleep time can be used for calculating eAHI. As expected, eAHI plays a significant role in datasets that include patients with poor adherence. Within our limited cohort, eAHI may provide a more accurate assessment of disease burden on treatment, particularly when adherence to treatment cannot be predicted.

LBA 1598
Insomnia Symptoms, Alcohol Misuse, and Suicidal Behaviors

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Introduction: Previous research found that insomnia symptoms predicted suicidal thoughts and behaviors (STB) in both cross-sectional and longitudinal studies. However, the mediators that may explain this relationship were not fully understood. The current study examined whether alcohol use mediated the relationship between insomnia symptoms and STB.

Methods: Data was drawn from ART 3.0, an ongoing study that examined risk and protective factors of substance use. Data was collected in the past year and included data collected between December 2024 and March 2025. Participants were 3715 college students from ten universities in the U.S. (M_{age}= 20.61, *SD*=5.24; 73% female, 68% White, 25% Hispanics). Insomnia symptoms were measured by the Insomnia Severity Index (ISI). Alcohol use was measured by the Alcohol Use Disorders Identification Test (AUDIT). Lifetime and past month suicidal thoughts and attempts (0=no, 1=yes) were measured by the Columbia Suicide Severity Rating Scale.

Results: Data were analyzed by multiple and logistic regression models. All analyses controlled for age, sex, and race. Insomnia symptoms significantly predicted AUDIT score (*b*=.141, *se*=.025, *p*<.001). Insomnia symptoms also significantly predicted all four suicide outcomes - lifetime suicidal thoughts (*OR*=1.106, *p*<.001), lifetime suicide attempts (*OR*=1.108, *p*<.001), past-month suicidal thoughts (*OR*=1.111, *p*<.001), and past-month suicide attempts (*OR*=1.148, *p*<.001). AUDIT scores significantly predicted lifetime suicide attempts (*OR*=1.03, *p*<.01). AUDIT significantly mediated the relationship between insomnia symptoms and lifetime suicide attempts (95% bootstrap CI=.001 to .008, *p*<.05). African American and Black students reported significantly more insomnia symptoms than other racial groups (*b*=.81 (.29), *p*<.01). Native-American students reported higher odds of lifetime suicide attempts (*OR*=3.233, *p*<.001) while African American and Black students reported higher odds of past-month STB (thoughts: *OR*=1.747, *p*<.05; attempts: *OR*=2.497, *p*<.01).

Conclusion: Alcohol misuse mediated the relationship between insomnia and suicide attempts. Insomnia symptoms increased the likelihood of alcohol misuse which in turn increased the odds of lifetime suicide attempts. We will discuss the implications of these findings on insomnia, substance use, and STB prevention and intervention among emerging adults.

Support: NIH 5U54 GM104944-10

LBA 1599

Augmenting Management of Obstructive Sleep Apnea with Consumer Wearable Devices Increases Use of Positive Airway Pressure Therapy

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Introduction: Patients with obstructive sleep apnea (OSA) are increasingly using consumer wearable devices (e.g., smartwatch) that measure oxygen saturation. A patient-facing report that juxtaposes this oxygen saturation data with positive airway pressure (PAP) adherence data has potential to impact PAP use. We piloted a wearable-based program ("mPAP"), assessing changes in PAP adherence as well as the acceptability, appropriateness, and feasibility of the mPAP program to determine favorability for future implementation.

Methods: 50 Veterans who were nonadherent to PAP therapy were randomized to immediately receive the 28-day mPAP program versus wait list-control (WC). A 2-sample, 2-sided *t*-test comparing change in PAP use (hours/night; days used > 4 hours/night in past 7 days) from baseline (T1) to 35 days after randomization (T3) in immediate versus WC groups was performed. Final outcomes were assessed in January 2025. Using phone (*n*=36) or desktop (*n*=11), participants rated their level of agreement from 1-5 (1=completely disagree, 5=completely agree) with statements measuring the acceptability, appropriateness, and feasibility of the program, and mean scores were calculated.

Results: At baseline (T1), in the immediate group (n=25, mean age 50.4, 85% male), participants used PAP 1.2 ± 1.5 hours/night, and in WC group (n=25, mean age 45.4, 92% male), participants used PAP 1.5±1.7 hour/night over 7-day period (p=.61, no significant between-group difference). The average change from T1 to T3 in usage of PAP was greater for the immediate group versus WC (+1.33±2.26 hours/night versus WC -0.17±1.63 hours/night; *p*=0.0097). Mean # days PAP was used > 4 hours/night over 7-day period increased from T1 to T3 by 1.32±2.14 days in the immediate group versus 0.12±1.88 days in the WC group (difference = 1.20; p=0.04). Average score for acceptability was 4.5±0.7, appropriateness was 4.4±0.7, and feasibility of the program was 4.5±0.6).

Conclusion: A consumer wearable-based program nearly doubled the hours of PAP use per night and increased days of PAP use. Overall measures of acceptability, appropriateness, and feasibility were favorable for future implementation. These pilot results suggest that the mPAP program is a promising intervention and that a larger trial is needed to assess its efficacy.

Support: ResMed Foundation

LBA 1600

Childhood Opportunity and OSA Among School-Aged Children Undergoing Polysomnography

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Introduction: The link between Pediatric Obstructive Sleep Apnea (OSA) and neighborhood opportunity remains unexplored. The Childhood-Opportunity-Index (COI) is a validated tool that measures children's neighborhood-level conditions as a surrogate to childhood opportunity in a global score (COI), education (ED), health-environment (HE), and socio-economic (SE) subdomains. We hypothesize that Moderate-Severe OSA in school-aged children undergoing polysomnography (PSG) is higher in those residing in neighborhoods with low opportunity.

Methods: Retrospective review of children 5-11 years old who underwent a PSG at Rady Children's Hospital between October-2016 and June-2024. Exclusion criteria: craniofacial, chromosomal, and neuromuscular disorders. Demographic characteristics included sex, age, BMI percentile (BMIp) and COI by zip code. This dataset was obtained and geocoded in February 2025. Those residing in areas with a moderate-to-very-low scores (COI<60), were compared to those with high-to-very-high scores (COI>60). Moderate-Severe OSA was defined as an obstructive apnea hypopnea index (OAHI) of ≥5/hour. Descriptive statistics were obtained. Logistic regression was used for the analysis of moderate-severe OSA and relevant predictors including global COI and its ED, HE and SE subdomains.

Results: 4723 school-aged children were included, mean age was 7.78 ± 1.68 years, 58% were of male sex, 30.3% of them met PSG criteria for Moderate-Severe OSA. Compared to children with an OAHI<5, those with moderate-severe OSA had higher BMIp (median 96.8 [IQR 69.4, 99.1] vs 82.9 [IQR 46.7, 97.3], p-value<0.01), while no difference in age or sex were observed. Children with moderate-severe OSA resided in higher proportions in areas with moderate-very low global COI (68.8% vs 61%, p-value<0.01), ED subdomain (59.9% vs 51.1%, p-value<0.01), HE subdomain (50.4% vs 46.5%, p-value<0.05) and SE subdomain (72.3% vs 65.9%, p-value<0.01), compared to those with an OAHI<5/hr.

Logistic regression identified that those residing in areas with moderate-to-very low COI, COI-ED and COI-SE were associated with an OR=1.26 (1.10, 1.44), OR=1.25 (1.10, 1.43), and OR=1.20 (1.04, 1.38) of moderate-severe OSA compared to those with high-to-very-high scores, respectively, after adjustment for age, sex and BMIp.

Conclusion: In a pediatric sleep laboratory population, we identified an association between lower neighborhood opportunity and higher rates of Moderate-Severe OSA.

Support: 1P50MD017344

LBA 1601

A Noninvasive Sleep-Based Biomarker for Disease: Insights from Traumatic Brain Injury

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Introduction: Sleep fragmentation – defined by frequent sleep-wake transitions – is a hallmark of various neurological conditions, including traumatic brain injury (TBI). While sleep duration and architecture have been extensively studied, quantifying sleep-wake transitions offers a novel approach to classifying injury severity and assessing sleep stability following various experimental TBI models. Here, we introduce a noninvasive method for detecting sleep-wake transitions using a piezoelectric cage system and assess its utility in characterizing baseline sleep architecture and post-injury sleep disturbances.

Methods: We developed an automated pipeline using a custom Excel VBA macro to efficiently process transition data, enabling high-throughput, noninvasive analysis of sleep fragmentation. This approach was applied to assess baseline sex differences in sleep stability and to investigate sleep-wake transitions as a biomarker for neurological outcomes after TBI. These data were collected in February of 2025.

Results: Under normal physiological conditions, female mice exhibited significantly more sleep-wake transitions than males (n=32; p=0.0175), emphasizing inherent sex differences in sleep stability. Next, we investigated the prognostic value of sleep-wake transitions by analyzing post-injury sleep following mild and moderate midline fluid percussion injury (mFPI) in adult mixed sex mice (n=94). Moderately injured mice exhibited significantly greater sleep fragmentation than those with mild TBI (p<0.0001), suggesting that transition frequency scales with injury severity and could serve as a biomarker for stratifying patient outcomes. Finally, in adult mixed-sex mice, we assessed the diagnostic potential of sleep-wake transitions across three distinct TBI models—controlled cortical impact (CCI), closed head injury (CHI), and mFPI—which replicate the heterogeneity of clinical TBI (n=102). Principal Component Analysis (PCA) of 72-hour post-injury sleep data revealed distinct clustering of TBI and sham groups (PC1: p<0.001), demonstrating that sleep-wake transitions differentiate injured from uninjured subjects.

Conclusion: The ability to quantify sleep-wake transitions without requiring surgical implantation of recording electrodes expands the applicability of this method to diverse experimental paradigms, including studies of circadian rhythms, neurodegenerative diseases, and pharmacological interventions. Moreover, our findings establish sleep-wake transitions as a scalable, non-invasive biomarker for TBI classification and severity assessment, offering potential applications for early diagnosis and individualized treatment strategies in neurotrauma care.

LBA 1602
Obstructive Sleep Apnea and Alzheimer's Disease Biomarkers

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Introduction: Obstructive sleep apnea (OSA) confers a risk for cognitive impairment and possibly Alzheimer's disease (AD)-related pathology. However, the mechanism remains unclear. We examined the relationship between OSA severity and plasma AD biomarker, cognitive function, and CSF volumetrics and the effect of OSA treatment on these outcomes. We hypothesized that the OSA severity is associated with worse AD biomarker profile, and worse cognitive processing function and increase extra-axial CSF volumes as a surrogate marker for glymphatic dysfunction. We also explored the effect of OSA treatment on these outcomes.

Methods: We enrolled cognitively normal middle-aged Veterans with newly diagnosed OSA and without OSA. OSA severity was categorized as no OSA (AHI<5), moderate OSA (15-29), and severe OSA (>=30). Plasma AD biomarkers included Aβ42/Aβ40 ratio. Cognitive processing speed was evaluated by the Symbolic Modality Test (SCTM), both oral and written. Extra-axial CSF volume was measured by brain MRI adjusting for total brain volume. We compared these outcomes between baseline and after 4 weeks of CPAP therapy. The plasma and MRI data analysis was conducted during Feb-March 2025.

Results: A total of nine participants (mean age 51±5) completed the baseline study, with five participants completing the follow-up after CPAP therapy. At baseline, there was correlation between OSA severity and plasma Aβ42/Aβ40 ratio (r=-0.71, p value=0.03) as well as SCTM scores (oral: r=-0.74, p value=0.001 and written: r=-0.85, p value=0.001). No correlation was seen with extra-axial CSF volume. CPAP adherence group had improved Aβ42/Aβ40 ratio by 7% while CPAP nonadherence group worsened by -2%. CPAP adherence group showed 11% and 6% improvement in SCTM oral and written scores, and CPAP nonadherence group showed worsening oral and written scores by -7% and -15%. There was no change in extra-axial CSF volume with CPAP.

Conclusion: There was correlation between OSA severity and plasma AD biomarker profile, and cognitive processing speed but not with extra-axial CSF volume. We observed

improvement of AD biomarkers and cognitive function with CPAP therapy. Ongoing data collection will be necessary to understand the true effect of CPAP on these outcomes.

Support: American Academy and Sleep Medicine Physician-Scientist Training Grant

LBA 1603

Predictors of Continuous Positive Airway Pressure Use Among Patients with Obstructive Sleep Apnea: A Prospective Observational Study Using the Bio-Psycho-Social Model of Adherence.

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Introduction: Continuous positive airway pressure (CPAP) is the standard treatment for obstructive sleep apnea (OSA). However, CPAP adherence is a challenge due to the interplay of biomedical, psychological, and social determinants. We aimed to use an integrative bio-psycho-social model of adherence to understand the factors that predict long-term CPAP use in a clinical setting.

Methods: We analyzed data from a prospective observational cohort, NICEPAP Study (NCT05067088), including adults newly diagnosed with OSA and prescribed CPAP at Yale Sleep Center (October 2020–March 2025). Before CPAP initiation, 151 biomedical, psychological, and social factors were collected using standardized questionnaires. Daily CPAP usage was measured using cloud-based monitoring over six-months. We identified factors associated with adherence from each domain using LASSO regression with 10-fold cross-validation (variables present with >50% in 1000 bootstrap samples were selected). CPAP adherence (weekly use, hours/night) over 26 weeks was modeled using a mixed, random-coefficient model, including time, for each domain. Significance was accepted at $p<0.05$. A final bio-psycho-social adherence model used predictors from each domain, with backwards selection ($p<0.1$) to avoid overfitting.

Results: Among 239 participants, 49% were female, 67% White, 20% Black, and 66% obese. Mean age was 52.8±15.3 years with apnea-hypopnea index of 29.4±24.0 events/hour, 41% exhibiting Epworth Sleepiness Scale >10 and 45% Insomnia Severity Index >14. CPAP use declined from 4.7±2.6 during week 1 to 3.5±3.2 hours/night by week 26. The final model included 15 biomedical, 4 social, and 1 psychological factor(s). From the biomedical domain, older age, anti-depressant use and anemia (among others) were associated with higher adherence (0.4 hours/night/decade, 0.9 and 1.2 hours/night respectively). In contrast, smoking, recent weight change and corticosteroid use were associated with lower CPAP use (1.8, 0.6 and 1.6 hours/night respectively). In the social domain, shift work and sleep latency were associated with lower (1.3 and 0.6 hour/night/hour), while private insurance was associated with higher (1 hour/night) adherence. Greater self-efficacy (psychological domain) was associated with increased adherence (0.5 hours/night).

Conclusion: The bio-psycho-social model helped identify novel factors relevant for CPAP adherence. This knowledge may enable recognition of and early interventions to increase CPAP use.

Support: NHLBI grant HL159259

LBA 1604

Automated Severity Rating of REM Sleep Behavior Disorder with Computer Vision

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Introduction: The severity of rapid eye movement (REM) sleep behavior disorder (RBD) symptoms is a key endpoint in clinical trials. To standardize assessment, the International RBD Study Group introduced a rating scale that classifies each movement as mild, moderate, or severe, assigning weights of 1, 5, and 10, respectively, to calculate a whole-night severity score. However, manual scoring is labor-intensive, time-consuming, and subject to inter-rater variability. This study aimed to develop an automated system for rating RBD severity using video recordings of REM sleep and computer vision, offering a more efficient and objective alternative to manual scoring.

Methods: Video-polysomnography (vPSG) was conducted on 60 patients (66±8.8 years, 82% males) with isolated RBD at the Stanford Sleep Center. An optical flow computer vision algorithm automatically detected motion during REM sleep and created movement clips separated by ≥1 second of immobility using a conventional 2D camera of vPSG. From each clip, 13 features were extracted; velocity and magnitude's mean, standard deviation, 80^{th}, 85^{th}, 90^{th}, and 95^{th} percentiles, and movement duration. Each clip was manually reviewed, and labeled as mild, moderate or severe. Machine learning classifiers were trained to automatically rate severity using a 10-fold cross-validation scheme. The whole-night severity scores generated manually and by the classifiers were compared on March 14th 2025.

Results: Among a total of 2,939 movements, 2,405 were labeled as mild, 516 as moderate, and 18 as severe. The manually rated whole-night severity score was 85±102. A random forest classifier achieved the highest performance in distinguishing moderate or severe movements from mild with an accuracy of 0.84 (sensitivity of 0.53, specificity of 0.91) and AUC of 0.84. A correlation of 0.96 was found between the manually and automatically generated whole-night severity scores.

Conclusion: This is the first study to show the feasibility of an automated video-based method to monitor RBD. Our machine learning model could accurately distinguish potentially injurious movements from mild ones and could automatically generate a whole-night severity score that correlated well with human ratings. This approach could be

implemented in the home environment for multi-night monitoring and could provide objective endpoints of RBD clinical trials.

LBA 1605

Effect of Pre-Sleep Autonomic Activity on Sleep Architecture in Healthy Adults

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Introduction: The effect of transcutaneous vagal nerve stimulation (tVNS) on sleep architecture has been demonstrated in a handful of studies, however most of those project do not examine healthy, young adults. It is unknown whether pre-sleep resting cardiac physiology predicts the effect of tVNS on sleep architecture. Here, in two separate in-lab, within-subject, sham-controlled, and counterbalanced studies, we investigated if pre-sleep resting heart rate variability (HRV), could predict how tVNS stimulation interacts with sleep architecture during the night.

Methods: 74 healthy adults (Women=38) between the ages of 18–38 (M_{age} = 23) completed two nights of polysomnographic recordings counterbalanced with active or sham tVNS stimulation. Pre-sleep resting ECG was collected while participants laid in bed in a supine position for five minutes before lights out. The root mean square of successive differences was used as an index of parasympathetically-mediated HRV. In study 1, tVNS was administered for 90 minutes during the first quartile of sleep at the onset of NREM Stage 2 (N=37). In study 2, tVNS was administered during the third quartile of sleep with onset ~3:30 AM (N=37). Data collection was completed November 2024 and analyses for this abstract were conducted March 2025. Mixed model linear effects analyses were performed with total, first half and second half sleep durations in N2, N3, REM as dependent outcomes and tVNS condition (sham vs stim) and study (1 vs 2) as fixed effects. Interaction terms for Condition × HF, LF-HRV, and Condition × Study were also included.

Results: The stimulation condition and study context did not alter sleep architecture (all p's > 0.40). Pre-sleep RMSSD was positively associated with REM durations in the first half of the night ($F(1, 96.87) = 9.451$, $p=0.003$), as well as SWS durations across the whole night ($F(1, 92.90) = 4.146$, $p=0.045$). No other relationships met significance thresholds.

Conclusion: These findings provide novel insight into how autonomic tone before sleep may change across the night and shape the restorative benefits of SWS and REM sleep, underscoring the role of pre-sleep parasympathetic activity in sleep regulation.

Support: None applicable.

LBA 1606

Evidence of Endogenously Driven Temporal Dynamics in Biomarkers of Alzheimer's Disease

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Introduction: Shift workers experience misalignment between central circadian rhythms and behavioral schedules. Night shift workers have a higher risk of developing Alzheimer's Disease (AD), but mechanisms are unclear. This study investigated the endogenous temporal dynamics of circulating AD pathology biomarkers in a constant routine (CR) protocol following three days of simulated day or night shift work.

Methods: N=11 healthy adults (ages 25.5±3.6y; 4 females) completed a 7-day in-laboratory study. Participants were randomized to a 3-day simulated day shift (DS) schedule (n=6) or a 3-day simulated night shift (NS) schedule (n=5), followed immediately by a 24h CR protocol where they stayed awake under constant behavioral and environmental conditions. Plasma collected via intravenous catheter every 3h during the CR was assayed using the automated Lumipulse platform on February 20th, 2025, to quantify Aβ42, Aβ40, and Aβ42/Aβ40 ratio—biomarkers associated with AD pathology. Biomarkers were analyzed using mixed-effects ANOVA with fixed effects of prior simulated shift condition, sampling time of day, and their interaction, and a random effect over participants on the intercept.

Results: There were significant effects of time for plasma Aβ42 ($F[4.548,40.93]=2.708$, $p=0.037$) and Aβ40 ($F[3.446,31.01]=2.809$, $p=0.049$), with highest levels in the early morning (07:30), a decline in the mid-morning, and then a gradual increase into the evening. These temporal dynamics appeared to be attenuated in the NS condition compared to the DS condition, but effects of condition and time by condition interactions were not statistically significant. Aβ42/Aβ40 ratio showed no significant effects for time, condition, or their interaction.

Conclusion: Under constant routine, Aβ42 and Aβ40 showed endogenous temporal dynamics, which were not significantly affected by the prior simulated shift work schedule. Mixed-effects cosinor regression analyses are needed to confirm any attenuation of these dynamics by a prior night shift schedule. This is consistent with previously published

analyses of melatonin and cortisol and indicates that the dynamics of Aβ42 and Aβ40 are driven by the central circadian pacemaker and remain misaligned to a shifted behavioral schedule, which may contribute to increased AD risk in night shift workers.

Support: Andy Hill CARE Fund, WSU CPPS start-up, and VISN20 MIRECC.

LBA 1607

Adolescent Grade Performance Across Early and Late School Start Times in Teens Across Alabama

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Introduction: School start time (SST) plays a large role in adolescent sleep, and can negatively impact high school performance. However, the connections between sleep, SST, and academic performance remain mixed and hard to distinguish from school factors that affect performance. Thus, we examined the sleep and grade performance in students from comparable schools (i.e., public, diverse, and in a similar region) that had early or late start times.

Methods: Adolescents (*N* = 413) completed a survey about their bedtimes and waketimes on school nights, grades in school, and SST. Adolescents were, on average, 15.60 years old (SD = 1.27), and 57.2% female. Race was self-reported as 49.1% White, 43.3% Black, 0.5% Asian, and 4.6% Multiracial. Early SSTs were classified as before 7:45 and late after 8:25 AM; 52.8% had early start times. Data were collected between March 2022 and February 2025. Group differences were evaluated with t-tests or spearman's rho depending on continuous or ordinal data, respectfully.

Results: Teens in early and late SST groups did not differ by age, year in school, gender, or ethnicity (all p's > .05). Race differed by start time (*rs* = 0.18, *p* = 0.006); more underrepresented racial groups were more likely to have later start times in this sample. Grades also differed by start time in the expected direction. Early start times had lower grades than late start times (*rs* = -0.11, *p* = 0.03). Early and late SST groups did not differ in their sleep duration, age, year in school, gender, and ethnicity (all p > 0.05).

Conclusion: Students with earlier start times had lower grades, but did not differ from teens in later start times on sleep duration. Circadian factors or social jet lag may be relevant for differing achievement in early versus late start times. These results highlight the complex relationships between SSTs, academic achievement, and demographic factors, underscoring the need for further research into the broader determinants of adolescent sleep and achievement.

Support: This work is supported by funding from NICHD (HD105153-01), PI: Heather E. Gunn, PhD

LBA 1608
Mandibular Tori – A New Warning Sign of Sleep Dysfunction?

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Introduction: Sleep bruxism is a parafunctional activity characterized by repetitive teeth grinding, jaw clenching, or bracing during sleep. It is also classified as a sleep-related movement disorder within the International Classification of Sleep Disorders. Research has shown that sleep bruxism affects sleep by reducing sleep efficiency and increasing sleep fragmentation, which in turn leads to daytime fatigue and sleepiness. The presence of mandibular tori (benign bony growth in the lower jaw)—may serve as a clinical indicator of longstanding bruxism. Although no studies to date directly link the presence of tori to sleep dysfunction, insomnia symptoms, or non-refreshing sleep, a pattern of comorbidity has been observed.

Methods: An observational study that concluded in March 2025 was conducted in a general dental practice to confirm whether anecdotal observations made by a dental sleep medicine specialist might be significant. Patients attending a routine dental hygiene recall appointment were asked to participate by completing a questionnaire. Their dental hygienist then performed a clinical exam and answered additional questions.

Results: Among respondents, the relationship between poor sleep quality and bruxism is evident. Patients treated for bruxism-related conditions (clenching, grinding or temporomandibular disorders) report statistically significant shorter sleep durations, more restless sleep, taking sleep medications more often, and problems feeling rested upon awakening as compared to those not treated for these conditions. Individuals with the presence of tori reported sleep that was restless or not quiet more frequently (M = 2.23, SD = .72) compared to those without (M = 1.97, SD = .81), $t(238) = -2.44$, $p = .02$. They also reported significantly higher teeth grinding at night (M = 2.10, SD = 1.26) compared to those without (M = 1.43, SD = 1.27), $t(120) = -2.76$, $p = .007$. Among this sample, there was a low prevalence of obstructive sleep apnea and there was no association between apnea and indicators of sleep bruxism (self-reported grinding/clenching, tori, or bruxism treatment).

Conclusion: This study suggests that the presence of tori may point to sleep bruxism as a contributing factor to sleep complaints and thus a warning sign of sleep dysfunction, independent of obstructive sleep apnea.

LBA 1609

Sleeping While Queer: Impacts of Sexual and Gender Identity-Related Concerns on Sleep Health in the LGBTQ+ Community Before and After the 2025 US Presidential Inauguration

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Objective: To examine the impact of sexual and gender identity-related concerns on sleep health in the LGBTQ+ community before and after the 2025 US Presidential inauguration.

Methods: LGBTQ+ adult participants completed an online survey containing questions about sexual and gender identity-related concerns and their impacts on sleep health. Pre-inauguration responses were collected June 2023 to September 2024. Post-inauguration responses were collected February to March 2025. Multivariable regression was used to assess impacts of sexual and gender identity-related concerns on sleep health pre- and post-inauguration. The survey was IRB exempt.

Results: 271 members of the LGBTQ+ community completed the survey (152 pre-inauguration, 119 post-inauguration). 74% of respondents have a diagnosed sleep disorder. 94% currently experience sleep problems, and of these, 98% reported that their sleep problems impact their physical, mental, and/or emotional well-being. 80% of respondents said concerns related to their gender and sexual identity may negatively impact their sleep.

Following the 2025 US presidential inauguration, there were significant increases in respondents' concerns about finding and maintaining friendships (OR 2.15, $p=0.007$), employment (OR 1.90 $p=0.021$), housing (OR 2.04, $p=0.043$), being safe in their homes (OR 3.39, $p=0.043$) and in public (OR 1.87, $p=0.013$), being bullied or harassed (OR 2.60, $p=0.002$), having restricted civil rights (OR 3.14, $p<0.001$), losing civil rights (OR 3.57, $p<0.001$), and accessing health care (including gender affirming care) (OR 2.36, $p=0.002$).

Transgender and nonbinary respondents were also significantly more likely to have concerns about maintaining family relationships (OR 3.64, $p<0.001$), and were significantly more likely than cisgender respondents to say their concerns have probably (OR 3.54, $p=0.003$) or definitely (OR 2.63, $p=0.02$) had a negative impact on their sleep.

Conclusions: This study finds that LGBTQ+ community members are experiencing significantly higher rates of minority stress-related sleep issues than before the 2025 US presidential inauguration. These differences may be linked to a post-inauguration increase in federal anti-LGBTQ+ policies and presidential executive orders. Overall, this study provides valuable insights into factors negatively impacting sleep health in LGBTQ+

communities following the 2025 inauguration, and highlights distinct differences between the impacts on transgender and nonbinary individuals and their cisgender counterparts.

Support: None.

LBA 1610

Effectiveness of Intensity Modulation in Closed-Loop Acoustic Stimulation During Naps

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Introduction: Slow-wave sleep (SWS) plays a crucial role in learning and memory. Recent studies have shown that closed-loop auditory stimulation can enhance SWS by targeting the UP-state of slow waves. This stimulation delivers pink noise pulses covertly during the N3 sleep stage, effectively increasing slow-wave activity and improving memory consolidation. While previous research has aimed to optimize SWS enhancement by varying the number and type of auditory stimuli, the effects of intensity modulation within a closed-loop framework remain unclear.

Methods: In this study, we investigated the impact of intensity variation on SWS by implementing a closed-loop auditory stimulation nap protocol in ten healthy young adults (5 females; aged 18-26 years), with data collected between December 6, 2024 and March 2, 2025. The baseline intensity (T) was calibrated during N2 stage and was delivered during UP-state slow waves at five intensity levels: a 10% increase (+10%T), a baseline level (T), a 10% decrease (-10%T), a 20% decrease (-20%T) and a 30% decrease (-30%T).

Results: Analysis of event-related potentials (ERPs) revealed that the +10%T condition exhibited higher values compared to the T condition at around +1300 ms and +1600 ms (uncorrected p-value). In addition, a significantly decreased ERP change in the +10%T condition at approximately +2000 ms suggests a prolonged SW cycle compared to the T condition (FDR-corrected p-value). Furthermore, mean amplitude comparison analysis showed that at around +1300 ms, there was a trend toward increasing amplitudes as intensity increased (-30%T → -20%T → -10%T → T → +10%T). However, at approximately +2000 ms, only the baseline intensity exhibited the highest amplitude among all other intensity levels. Spectrogram analysis further supports a prolonged response in slow-wave activity in the +10%T condition.

Conclusion: These findings suggest that modulating auditory intensity within a closed-loop framework can enhance SWS in different ways. If aiming for a slow wave amplitude enhancement only, the baseline level sound is needed. In contrast, if aiming for a prolonged SW cycle manipulation, an intensity exceeding the baseline level can be considered.

LBA 1611

Insufficient Sleep Among Parents of Children with Intellectual and/or Developmental Disabilities: Findings from the 2011-2018 National Health Interview Survey

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Introduction: The prevalence of intellectual and/or developmental disabilities (IDD) has significantly increased. Addressing the health of parents of children with IDD is an important health policy goal because these parents are at greater risk of adverse health outcomes. While insufficient sleep is significantly related to poor health and has been reported among parents of children with IDD, previous studies have focused on specific types of IDD and were limited by small sample sizes. Our study used a nationally representative, cross-sectional sample to compare the prevalence of insufficient sleep among parents of children with and without IDD.

Methods: Using the National Health Interview Survey data from 2011-2018, we included parents of children with IDD (n=3,378) and without IDD (n=20,545). We estimated a multivariable regression predicting insufficient sleep (< 6 hours vs. 6+ hours). We estimated multivariable binomial logistic regression models to obtain the adjusted odds ratios of insufficient sleep among parents for having a child with an IDD. Covariates included child and parent-level sociodemographic characteristics, including the number of chronic health conditions.

Results: 40.54% of parents of children with IDD reported insufficient sleep compared to that of 34.50% in parents of children without IDD (AOR=1.20, 95%CI:1.09-1.33). Parents of children with IDD reporting high income or a college degree did not report insufficient sleep.

Conclusions: Our study is the first to use a nationally representative US sample and found that parents of children with IDD are more likely to have insufficient sleep than parents of children without IDD. However, after adjusting for several covariates, parents of children with IDD who have high incomes and a college degree attenuated the negative effect of raising a child with IDD on sleep. Given the importance of sleep to health, improving sleep health, especially for those with middle and low-income families and lower educational levels, is warranted and may prevent adverse health outcomes in this population.

Support: No funding support for this study.

LBA 1612

Vitamin D Supplement Intake is Associated with Less Cognitive Impairment in Persons with Sleep Disturbance

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Introduction: Sleep disturbances afflict almost half of those with Alzheimer's Disease (AD), resulting in decreased quality of life. Vitamin D and other supplements have been shown to decrease risk of AD, but not much is known about their impact on cognitive health in the context of sleep disturbance. This study explored associations between cognitive function and vitamin D supplement intake in individuals with MCI and disturbed sleep

Methods: This cross-sectional study included 32 participants with mild cognitive impairment (MCI) and disturbed sleep symptoms (as determined by Epworth Sleepiness Scale (≥10) and/or Pittsburgh Sleep Quality Index (≥5) with data collected between December 2023- January 2025. We administered the MoCA (Montreal Cognitive Assessment). Vitamin D supplement intake was assessed using a modified Food Frequency Questionnaire (FFQ). A multiple linear regression model was utilized to examine the association between vitamin D supplement intake and cognitive impairment (MoCA score), controlling for baseline covariates of age, sex, education, and race.

Results: The mean age was 71.9 (5.3), 30% were African American, and 32% were male. Vitamin D (Y/N) showed a marginally significant association with total MoCA score (adjusted mean (SE) = 2.77 (1.11); p = 0.021). Having an advanced degree was significantly associated with a higher total MoCA score (adjusted mean (SE) = 5.69 (1.96); p = 0.009).

Conclusion: This is the first study to evaluate the relationship between vitamin D supplement and cognitive health in sleep disturbed individuals. Our findings suggest that taking vitamin D supplements is associated with less cognitive impairment in participants with sleep disturbances.

Support: NIH, R61AG080606-01, Pak, Victoria (PI)

LBA 1613
Does Greenspace Influence Sleep After Accounting for Air Pollution and Weather?

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Introduction: Prior research has shown that greenspace exposure benefits sleep. However, weather and air quality influence sleep by affecting comfort, breathing, and overall sleep quality, making them crucial confounders for greenspace and sleep studies. This study examines the association between greenspace exposure and children's sleep while accounting for weather and air quality.

Methods: School children in grades 1-3 in the ongoing Project Greenspace, Sleep, and Mental Health (G-SPACE) study in Rhode Island were recruited to wear a GPS and an accelerometer for seven days. Sleep measures from actigraphy were analyzed for associations with greenspace exposure, assessed using participants' home addresses, through linear regression models. Normalized Difference Vegetation Index (NDVI) values, the Green Street View Index (GVI), and tree canopy coverage within 100m, 200m, and 300m street network buffers surrounding each participant's residential location were extracted. The mean values of temperature, humidity, precipitation, wind speeds and vapor pressure deficit (VPD) captured weather status, and PM2.5, PM10 and Carbon monoxide (CO) were used as air quality variables during the data collection period. To measure weather and air quality data for our 2024 participants, we use 2024 data calibrated by the Environmental Protection Agency in March 2025

Results: One-hundred thirty-one participants (Hispanic:43%, Non-Hispanic:57%; Mean age:7.49 years, SD:0.97) were included in our analysis. Greenspace (NDVI) is marginally positively associated with *Time in bed* within the 200-meter buffer (β:0.14, P:0.06) after controlling for precipitation, VPD, PM10, and CO. However, GVI bordered on a negative association with sleep efficiency within the 200-meter buffer (β:-0.57, P:0.09) after controlling for wind speeds, VPD, and PM10. Tree canopy is also marginally negatively associated with sleep efficiency within a 100-meter buffer (β:-0.59, P=0.09) after controlling for humidity, and PM10.

Conclusions: While our results were marginally significant across various measures of greenspace exposures, our findings suggest that greenspace within smaller buffer sizes of residential locations are associated with sleep outcomes for children when controlling for

weather and air quality. A larger sample size and additional environmental factors should be explored for more robust analyses.

Support (if any): Project G-SPACE is supported by the NIH/NIMHD (R01MD016241) and NIGMS 5P20GM139743

LBA 1614
Sound the Alarm! Delaying Shift Start Times Improves Firefighter Sleep

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Introduction: Firefighters commonly work extended shifts that significantly limit sleep opportunities. Previous research has suggested that delayed shift start times may allow firefighters to achieve longer sleep duration particularly on nights before commuting to work. In July 2024, the Roswell, GA Fire Department transitioned from a 24-hours-on/48-hours-off (24/48) schedule starting at 8:00 AM to a 48-hours-on/96-hours-off (48/96) schedule starting at 11:00 AM. This ongoing longitudinal study examines the effect of the new schedule on total sleep time (TST) at home and work, and specifically on nights before commuting to and from work.

Methods: A within-subjects design tracked firefighters before (pre) and after (3-month post) the shift time change. Participants (n=14) wore wrist actigraphy devices for approximately 14 consecutive days during each condition to objectively record TST. Paired t-tests assessed differences in TST across four key scenarios: (1) overall sleep at home, (2) overall sleep at work, (3) sleep on nights preceding commuting to work, and (4) sleep on nights preceding commuting home. Data was assessed in January 2025.

Results: Paired t-tests showed a statistically significant increase in TST on nights preceding commutes to work, from 366±53 minutes to 417±60 minutes ($p=0.003$). Average sleep at home increased from 412±52 to 435±59 minutes; however, this change did not achieve statistical significance ($p=0.13$). Sleep at work showed a slight, nonsignificant increase from 390±60 to 396±48 minutes ($p=0.71$). No meaningful differences emerged for sleep duration on nights preceding commuting home (390±60 vs. 393±61 minutes, $p=0.87$).

Conclusion: Results suggest that delaying shift start times can significantly improve sleep duration on nights prior to commuting to work. However, departmental discussions identified cultural and logistical factors—such as peer pressure to awaken early, early arrivals of other personnel, and morning responsibilities—that limited potential benefits on shift-end mornings. Given these findings, we plan to reassess firefighter sleep patterns one-year post-transition to further evaluate long-term impacts of the delayed start schedule and departmental practices on sleep and health outcomes.

Support (if any): This project was supported by the City of Roswell, Georgia, providing funding for data collection. Research coordination and analytics were conducted through Translate LLC.

LBA 1615

Genetic Associations Between Excessive Sleep and Cardiac Dysfunction in Flies and Humans

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Introduction: Insomnia is the most prevalent sleep disorder and is associated with numerous adverse health outcomes, including cardiovascular disease (CVD). While previous studies have reported a link between insomnia and CVD, the genetic relationship between various sleep traits and cardiovascular health remains unclear.

Methods: Using human GWAS data, we evaluated multi-trait associations for the top insomnia-related loci and cataloged genome-wide significant associations for sleep and cardiovascular traits using the Sleep and Cardiovascular Disease Knowledge Portals. Additionally, we measured genetic correlations between sleep and CVD-related traits by performing linkage disequilibrium score regression analysis. To functionally validate these findings, we utilized *Drosophila melanogaster* as a model system. We assessed the effects of neuronal- and heart-specific knockdown of candidate genes on sleep and cardiac function using the UAS/GAL4 system. Additionally, we examined the non-cell-autonomous effects of brain knockdown on heart function and vice versa, to determine systemic interactions between sleep and cardiovascular phenotypes.

Results: Our analyses revealed significant genetic overlap between sleep and CVD-related traits. We identified three SNPs significantly associated with both insomnia and coronary artery disease (CAD), two of which were also linked to myocardial infarction (December 2024). Additionally, genetic correlation analysis demonstrated that increased sleep duration, daytime sleepiness, and napping were significantly associated with CAD, heart failure, and myocardial infarction, conditions commonly linked to altered heart rate regulation (March 2025). Our functional studies in *Drosophila* identified genetic mechanisms that link sleep and cardiac function. Interestingly, we found that neuronal knockdown of insomnia- and CVD-related genes that resulted in prolonged sleep duration was accompanied by an increased heart rate, mirroring findings from human genetic data (December-March 2024).

Conclusion: Our findings highlight a genetic connection between sleep dysfunction and cardiovascular disease, reinforcing shared genetic signals between insomnia and CVD. Furthermore, we uncover a novel genetic association between increased sleep duration and adverse cardiovascular traits in both humans and flies. This study advances our understanding of the genetic mechanisms linking sleep regulation to cardiovascular health

and underscores the importance of considering multiple sleep traits in assessing cardiovascular risk.

LBA 1616

High-Throughput Analysis of Microglia Morphology, Neuronal Integrity, and Sleep Disturbances in a Mouse Model of Repetitive Traumatic Brain Injury

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Introduction: Traumatic brain injury (TBI) leads to persistent sleep disturbances, which can worsen functional outcomes and impede rehabilitation efforts. Despite the prevalence of post-TBI sleep disturbances, the relationship between sleep and underlying neuroinflammatory and neurodegenerative pathology remains poorly understood. To address this gap, we developed a high-throughput pipeline to assess microglial morphology and neuronal integrity alongside sleep-wake disturbances, enabling a comprehensive evaluation of injury-induced changes across multiple domains.

Methods: C57BL/6 mice underwent sham, single (1-hit), or repetitive (2-hit) midline fluid percussion injury. Physiological parameters were measured non-invasively to characterize TBI-induced sleep alterations. Brain tissue was collected at 7, 14, or 28 days post-injury for immunohistochemical analysis. Serial sections were stained for Iba-1 (microglia) and Olmos amino cupric silver (neurodegeneration). Using brightfield whole-hemisphere imaging and automated Python-based analysis on a high-performance computing cluster, we quantified microglial morphology at single-cell resolution (~6 million microglia analyzed) and assessed neuronal integrity via pixel density analysis of silver-stained neurons. Data were collected in March 2025.

Results: Both single and repetitive TBI resulted in significant sleep disturbances, with greater disruption following repetitive injury. Microglial reactivity increased post-injury, with high-density clusters concentrated between bregma and lambda. Neuronal degeneration co-localized with regions of microglial reactivity, supporting a link between neuroinflammation, neurodegeneration, and sleep disruption. Notably, the severity and spatial distribution of pathology varied over time post-injury, suggesting dynamic injury progression.

Conclusions: Our novel brightfield-based microglial analysis pipeline enables brain-wide, single-cell resolution assessment of neuroinflammation, providing new insight into TBI-induced pathology. These findings highlight the intersection of neuroinflammation, neurodegeneration, and sleep dysfunction in TBI, emphasizing the need to consider sleep as both an outcome and potential modulator of injury progression. Future studies will further investigate mechanistic links between microglial activation, neuronal vulnerability, and sleep disruption to inform therapeutic strategies for mitigating chronic TBI pathology.

Support: NIH-T32-HL149646

LBA 1617

Brain Transcriptomics Across Diverse Sleep-Wake Manipulations Reveals Candidate "Sleeper" Genes that Track Sleep-Wake History

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Introduction: Sleep is governed by two processes: a circadian process that times sleep and wake and a homeostatic process that drives sleep as a function of prior wake history. Discovered in the fruit fly *Drosophila*, the *period* (*per*) gene is a "universal" cornerstone of the circadian clock, robustly oscillating at the transcript level, in all organs and tissues and in essentially all animals. We hypothesized that there may be a comparable factor (we term "slee-per" or sleeper) for sleep homeostasis.

Methods: To identify sleeper, we performed a wide-ranging transcriptomic analysis to identify genes whose expression tracks sleep-wake history in *Drosophila*. We use a variety of methods to manipulate sleep-wake including mechanical, thermogenetic, optogenetic, pharmacological and circadian/baseline. We also examined whole brain as well as more targeted cell-types implicated in sleep-wake regulation. Since December, 2024, we computationally examined a remarkable 24 datasets seeking genes that uniformly reflect sleep-wake state dependence consistently across two or more datasets.

Results: We identified about 2000 genes that fulfill these criteria. Focusing on the whole brain datasets, we identified a number of intriguing pathways using Gene Ontology analysis ($q<0.1$) upregulated during sleep including membrane excitability (sodium, calcium channels), presynaptic active zone (including cytoskeleton), histone modifications, protein translation, neurotransmitter receptors, and midline choice point/semaphorin pathways. Among the wake upregulated pathways are metabolic related (cell redox homeostasis, mitochondrial translation, lifespan), protein translation/rRNA binding, and protein folding/unfolded protein response.

Conclusion: We have initiated a large-scale genetic screen to interrogate the in vivo function of these genes in sleep regulation and homeostasis. Collectively, these studies provide unique molecular clues to the elusive identity of sleeper.

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LBA 1618

Rapid Eye Movement (REM) Sleep Characteristics in Individuals with First-Episode Psychosis and Healthy Controls

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Introduction: Sleep abnormalities, including non-rapid eye movement (NREM) sleep oscillations deficits, are well-documented in psychotic disorders. However, rapid eye movement (REM) sleep—crucial for emotional memory processing and synaptic plasticity—remains understudied. This study provides the first investigation of phasic and tonic REM states and associated EEG power spectra in first episode psychosis (FEP) compared to healthy control (HC).

Methods: High-density sleep EEG recordings were collected from twenty FEP and twenty HC participants. REM sleep was divided into 6-second epochs and classified as phasic or tonic based on the rapid eye movements presence or absence. EEG power spectral analysis was performed using both raw and Z-scored values. Linear mixed effect models assessed differences between REM states and groups, with age and sex as covariates: Power ~ Group + State + Group×State + Age + Sex + (1|ID), with p-values FDR-corrected across 62 EEG channels. Post-hoc tests examined significant effects and correlations with MATRICS Consensus Cognitive Battery (MCCB) performance. These analyses were conducted between late 2024 and early 2025, with completion in March 2025.

Results: No main Group effects were observed, though multiple State effects existed. HC exhibited phasic>tonic power in delta and theta bands, while FEP showed tonic>phasic in sigma band. Both groups showed tonic>phasic in beta band. Z-scored analyses revealed similar patterns in delta, alpha, theta and beta bands, while gamma showed opposite patterns between groups (tonic>phasic in HC; phasic>tonic in FEP). Significant Group×State interactions were found in four central EEG channels for z-transformed theta power ($11.8<F<24.93$; adjusted $p<0.005$). Post-hoc analyses revealed higher phasic vs tonic theta power in these channels in FEP ($4.7<t<6.9$, adjusted $p<0.0001$), but not in HC ($-0.16<t<0.44$, adjusted $p>0.9$). Group comparisons showed lower z-transformed theta power in FEP vs HC for tonic REM in three of those channels, with no group differences in phasic REM. Positive correlations were found between z-scored theta power and MCCB total scores across all four channels in FEP, but not in HC.

Conclusion: FEP showed shared and distinct spectral power dynamics between REM states in different EEG frequency bands, with alteration in theta band suggesting potential implications for cognitive processing.

LBA 1619

Examining EEG Oscillatory Activity During Phasic and Tonic REM Sleep in Healthy Individuals

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Introduction: Rapid eye movement (REM) sleep and its oscillations in the delta-theta frequency bands (i.e., sawtooth waves) are important for cognitive processes and consolidation. Sawtooth waves are more commonly coupled with eye movements during phasic REM; however, the occurrence and characteristics of these waves during phasic and tonic REM sleep remain largely undetermined. Here we explored the properties of delta-theta REM oscillations during phasic and tonic REM sleep, including their relationships with cognitive performance.

Methods: High-density sleep EEG recordings (N=62 channels) were collected from twenty healthy individuals. REM sleep was divided into 6-second epochs, scored as phasic or tonic based on the presence or absence of rapid eye movements, respectively. Several sawtooth wave parameters (density, integrated activity, positive peak amplitude, average upslope, average downslope, duration) were automatically extracted using different period (1-2, 1-4, 1-6, 2-4, 2-5, 2-6 Hz frequency ranges) and amplitude (0, 5,10, 20 μV) thresholds. Comparisons between phasic and tonic REM and correlations with MCCB cognitive tests were performed with FDR-corrected paired t-tests and Pearson's rho, respectively. Analyses were conducted between late 2024 and March 2025.

Results: Higher sawtooth wave density and integrated activity were found in phasic vs. tonic REM in fronto-central areas only when waves of higher frequencies (i.e., 5-6 Hz) and lower amplitudes (0 or 5 μV) were included. Lower positive peak amplitude was also present in phasic vs. tonic REM in centro-parieto-occipital regions across all amplitude thresholds and frequency ranges > 2Hz. No significant correlations emerged between phasic and tonic waves parameters and cognitive performance.

Conclusion: In healthy volunteers, sawtooth wave characteristics differ between phasic and tonic REM, especially in fronto-central regions. Building on these initial findings, future work may help clarify the role of REM sleep oscillations in healthy subjects and clinical populations.

LBA 1620

Sleepiness and School Engagement Across Early and Late School Start Times in Black and White Adolescents

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Background: Later high school start times are linked to more sleep in adolescents. However, few studies examine the effect of school start times across racially and economically diverse groups attending public schools. Moreover, we know little about other measures of academic success such as school engagement. Thus, in this observational study, we examined daytime sleepiness and school engagement in early and late school start times in adolescents from the Deep South.

Methods: Alabama adolescents (n = 313, M age = 15.63, SD = 1.21) enrolled in high school completed a Qualtrics survey about their sleep health as part of a larger study on school start times. Data collection took place from March 2022 to February 2025. Participants were enrolled based on early (before 7:45 AM) versus late (after 8:25 AM) start times. In the early school start time group, adolescents self-identified as 63.9% White, 36.1% Black, and 58.8% female. In late school start times, adolescents self-identified as 57.1% White, 42.9% Black, and 51.2% female. Sleepiness was assessed via the Cleveland Adolescent Sleepiness Questionnaire and engagement was assessed via the Student School Engagement Measure. Pearson correlations were used to evaluate associations among study variables and were stratified by start time.

Results: Among early ($r = -0.248$, $p < .001$) and late ($r = -0.256$, $p = .020$) start times, more daytime sleepiness was associated with less school engagement. Black students in the early start time group had more daytime sleepiness than White students ($r = -0.144$, $p = .035$). There were no differences by race in the late school start time group ($r = -0.029$, $p = .798$).

Conclusion: School engagement, which is separate from academic success, is predictive of high school graduation success. In our sample, sleepiness predicted less engagement in early and late school start times. Targeting sleepiness may be one way to increase school engagement.

Support: This work is supported by funding from NICHD (HD105153-01), PI: Heather E. Gunn, PhD

LBA 1621

Bedtime Autonomy and Adolescent Sleep: Exploring Age Differences in an Underrepresented Sample

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Introduction: Adolescents' autonomy over their bedtime routines may play a critical role in shaping their sleep patterns, yet research on this relationship remains limited, particularly among underrepresented populations. As adolescents age, bedtime autonomy may promote healthier sleep due to their increasing desire for independence but may pose risks for younger adolescents if granted prematurely. The current study addresses this gap by examining the role of bedtime autonomy and age on adolescent sleep within an underrepresented sample.

Methods: Ninety-three parent-adolescent dyads recorded sleep and rated interpersonal interactions for 14 days. Adolescents were on average 15.5 years old and 66% female. Race and ethnicity were self-reported and were 65% Black, 28% White, 12% Hispanic, and 7% biracial. The independent variable, adolescent-rated autonomy at bedtime, was assessed on a 0-100 scale; higher scores indicated more autonomy. Dependent variables, adolescent sleep quality, sleep duration and sleep efficiency, were assessed with the Pittsburgh Sleep Diary. Multiple regression analyses evaluated the interaction between age and bedtime autonomy, after controlling for demographic variables (race, SES, and economic deprivation), on sleep outcomes. Data were collected between March 2022-February 2025.

Results: After controlling for the effects of race, SES, and economic deprivation, there was an interaction between adolescent age and bedtime autonomy on sleep duration ($b = 0.41$, $p < 0.001$), such that older adolescents who were more involved in their own bedtime routines (i.e., more autonomy) had longer sleep duration, whereas younger adolescents had shorter sleep duration. Similar results were found for sleep efficiency ($b = 0.001$, $p < 0.001$), such that older adolescents with more bedtime autonomy had higher sleep efficiency compared to younger adolescents. There was no interaction between age and bedtime autonomy on sleep quality ($p > 0.05$).

Conclusion: Findings suggest that bedtime autonomy is particularly beneficial for older adolescents, as greater involvement in their own bedtime routines was associated with longer sleep duration and higher sleep efficiency. These results highlight the importance of considering developmental stage and autonomy in sleep interventions, especially for underrepresented youth.

Support: This work is supported by funding from NICHD (HD105153-01), PI: Heather E. Gunn, PhD

LBA 1622

The Impact of Insomnia Symptoms on Recognition Memory and Mnemonic Discrimination in Older Adults with Mild Cognitive Impairment

Authors: Leah Harris, Kathleen O'Hora, Allison Morehouse, Abigail Cirelli, Adam Krause, Maryam Ahmadi, Raquel Osorno, Bryce Mander, and Andrea Goldstein-Piekarski

Introduction: Impaired memory, including mnemonic discrimination ability, is a core symptom of patients with Mild Cognitive Impairment (MCI), who are at risk for Alzheimer's disease (AD). Insomnia symptoms are also prevalent in MCI patients. While sleep is known to support memory, the relation between insomnia symptoms and the severity of memory impairments in MCI patients remains unclear. Here, we tested the hypothesis that greater insomnia symptom severity would predict worse recognition memory and mnemonic discrimination ability in MCI patients.

Methods: We analyzed baseline data from an ongoing clinical trial (last data for this analysis collected 2/28/25) investigating the impacts of an insomnia intervention in older adults with MCI, neuropsychiatric symptoms, and sleep disturbances. Participants (n=49, Mage=64.3 +/- 7.15, 65.3% female) completed sleep and memory assessments, including the Behavioral Pattern Separation Task – Object (BPT-O). Recognition memory and mnemonic discrimination were assessed by the three-phase BPT-O – encoding, immediate retention, and delayed retention the following morning. During the delayed retention phase, participants are shown four categories of images, objects identical to the encoding phase (repeats, "old"), and similar or novel objects (lures and foils, "new"). Recognition memory was measured using a cubed-root transformed d' model to assess recognition memory sensitivity, with greater values indicating a greater ability to distinguish old items from new items. Mnemonic discrimination was measured using the Lure Discrimination Index (LDI), with greater values indicating a greater ability to distinguish similar items from old items. Insomnia severity was measured by the Insomnia Severity Index (ISI).

Results: Linear regression, using age and sex as covariates, confirmed our hypothesis that greater insomnia severity was significantly associated with worse recognition memory ($b = -0.057$, $p = 0.011$), but was not associated with poorer mnemonic discrimination ($b = -0.139$, $p = 0.739$). Note that these are unstandardized coefficients, and differences in scale should be considered when interpreting effect sizes.

Conclusion: Greater insomnia symptoms were associated with worse recognition memory, but not specific mnemonic discrimination, suggesting insomnia may affect global memory but not hippocampal-specific pattern separation abilities in older adults with MCI.

Support: This study is supported by NIH Grants R01MH120776, R01MH120776-05S2, and R01MH12077- 05S1.

LBA 1623
Sleep Blood Pressure Surges Uncovered with Home Sleep Study

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Introduction: Blood pressure (BP) surge in association with sleep events, such as obstructive sleep apnea (OSA), may exert adverse effects on cardiovascular health. Incorporating the pulse transit time (PTT)-method into a sleep study allows to detect sleep event-related BP surges. The purpose of the study was to characterize BP surges via PTT-derived BP recording performed in conjunction with a home sleep study.

Methods: We enrolled patients who were clinically diagnosed with OSA. We used a commercially available home sleep study platform that employs PTT-based BP estimation enabled by adding a single lead electrocardiography channel to the conventional respiratory and electroencephalogram channels. PTT is determined by the time interval between electrocardiography R wave to pulse arrival time determined by photoplethysmography. Significant BP surge event was defined if there was a greater than 20 mmHg increase in systolic BP (SBP) following an OSA event. We examined whether the hourly BP surge events (BP surge index) differed by baseline characteristics and sleep stages. Values are expressed by mean (SD). The analysis includes participants enrollment completed in March 2025.

Results: We included 20 subjects (mean age: 48 years, female 25%) with various OSA severity (median Apnea hypopnea index [AHI] 10/hr). After excluding one subject with a poor signal quality, 19 subjects were included in the analysis. BP surge index was higher in a younger age group (7.1 [8.2] vs. 3.0 [4.5]), higher OSA severity group (AHI≥10 vs. AHI<10 = 7.4 [8.3] vs. 2.1 [2.0]), and those with hypertension (hypertension vs. no hypertension) (9.3 [10.8] vs. 3.3 [3.8]). BP surge index was the highest in REM sleep (4.5 [7.6]), followed by N1 (4.4 [11.0]), N2 (3.6 [5.1]), and N3 (0.96 [1.9]) being the lowest. However, these differences were not statistically significant due to the small sample size.

Conclusion: Significant episodic BP surges related to OSA can be captured by PTT-based continuous BP recording in conjunction with sleep recording in the home setting. Baseline patient characteristics and sleep stage appear to have associations with the frequency of significant BP surge events.

Support: ResMed Foundation

LBA 1624

The New Kid on the Block - Natural Language Processing: A New Approach to Analyzing Sleep Related Issues in the Inpatient Setting

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Introduction: Natural language processing at a large scale can offer the opportunity to gain insights into large datasets of text that may otherwise be difficult to manage through traditional methods. Poor sleep quality has been associated with adverse effects (i.e., increased pain perception, cognitive dysfunction, and delayed recovery). Despite this, practice patterns vary among practitioners in managing acute insomnia and sleep disturbances in the inpatient setting. This study aims to analyze the impact of sleep difficulties, their management, and effect on the hospital length of stay (LOS) with the use of a large language model (LLM).

Methods: The datasets MIMIC-IV and MIMIC-IV-Note were examined in March 2025. A random sample of 125,000 patients were selected to balance cost, computational efficiency, and representativeness. Patient documentation including history of present illness and discharge summaries were evaluated with “gemini-2.0-flash” via one-shot batch prompting to extract details regarding sleep-related issues and management during the hospital stay at Beth Israel Deaconess Medical Center. Outputs were evaluated based on presence of sleep-related issues, location, and associated newly prescribed insomnia medications by discharge. These populations were evaluated for statistically significant differences in their distributions using the Mann-Whitney U test.

Results: Analysis of 125,000 patient encounters revealed that the mean hospital LOS was significantly longer for patients with sleep-related issues (201.9 hours) than for those without (115.9 hours) ($p < 0.0001$). ICU patients with sleep-related issues exhibited a longer mean LOS (365.8 hours) than those without (224.7 hours) ($p < 0.0001$). The most prescribed medications for sleep were trazodone, zolpidem, and lorazepam. Prescription of zolpidem was associated with the shortest length of stay (155 hours).

Conclusion: This study highlights the potential of large language models to drive the discovery of new insights to such a large scale. It shows the significant impact that sleep-related issues and their management play during in-hospital admissions and length of stay. While clinical outcomes and decisions are inherently complex, the patterns derived from this analysis open an opportunity for further inquiry and

exploration.

Support: None

LBA 1625

Participant Lifestyle Characteristics Modify Insulin Sensitivity in Sleep and Circadian Interventions

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Background: Circadian misalignment and short sleep duration are linked to type 2 diabetes risk, though mechanisms remain unclear. We are investigating how sleep extension (EXT) and circadian interventions (CIRC) affect insulin sensitivity, but baseline characteristics may mediate intervention response. Thus, circadian timing, moderate-to-vigorous physical activity (MVPA), insulin sensitivity, and BMI at baseline was compared between intervention groups.

Methods: Data from the final three CIRC participants was collected between 12/2024 and 3/2025, with all analyses conducted in March 2025. Eleven adults (8M/3F) aged 28.0±7.44y (mean±SD) completed CIRC, and 17 adults (9M/8F) aged 24.82±4.86y completed SE interventions, all with habitual sleep <6.5h/night. At the end of a 1-2-week baseline monitoring segment during which participants wore GENEActiv (sleep, MVPA) or activPAL devices (MVPA), participants in both protocols completed overnight laboratory visits in dim-light (<2 lux max) with a morning oral glucose tolerance test (OGTT) to calculate baseline Matsuda Index (MI) insulin sensitivity. Additionally, hourly saliva samples were collected to calculate baseline dim-light melatonin offset (DLMOff) prior to beginning interventions.

Results: Baseline MI insulin sensitivity was lower ($p<0.05$) in the CIRC (2.99±1.52) versus EXT (10.63±11.44) group. Baseline BMI was higher ($p<0.01$) in CIRC (29.27±2.26 kg/m^2) versus the EXT group (23.03±2.23 kg/m^2). BMI showed a weak positive correlation with MI ($r=0.25$, $p<0.05$). Sleep duration, age, clock hour of DLMOff, clock hour of waketime, the phase-angle between DLMOff and waketime, and average daily MVPA were not significantly different at baseline between CIRC and EXT intervention groups.

Conclusion: Preliminary data suggest that among adults with short sleep duration, BMI is a stronger determinant of insulin sensitivity compared to circadian timing, age, or MVPA. Final data analyses will further elucidate the relationship between sleep and metabolic disease risk by incorporating insulin sensitivity responses to EXT or CIRC, and by measuring BMI, sleep duration, sleep timing, circadian timing, and MVPA post-intervention for both groups. Further research is needed to determine the complex relationship between sleep, circadian timing, and BMI, and how sleep and circadian timing can be modulated to alleviate type 2 diabetes risk.

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LBA 1626

Age and Sex Contributions to Long-Term CPAP Compliance: What We Know and What Matters

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Introduction: Obstructive sleep apnea (OSA) is a prevalent sleep disorder with significant health consequences if untreated. Continuous positive airway pressure (CPAP) is the gold-standard therapy, yet adherence remains a critical barrier. This study evaluates CPAP compliance trends and identifies key demographic and clinical factors influencing adherence in a cohort of OSA patients.

Methods: This retrospective observational study included 201 adult patients with OSA, collected between December 2024 and February 2025. Compliance was assessed after CPAP initiation and at a long-term follow-up. Compliance was defined as CPAP use for ≥4 hours on ≥70% of nights. Demographic variables (age, sex), residual apnea-hypopnea index (AHI), and compliance metrics were analyzed. Paired t-tests compared first and most recent compliance. A hierarchical logistic regression evaluated predictors of ≥70% compliance, and hierarchical linear regression assessed changes in compliance percentage over time.

Results: At initiation, 98.51% of participants met the ≥70% compliance threshold, which declined to 79.10% at follow-up. While overall compliance did not significantly change (d = -1.77, SD=26.85, p=0.3394), subgroup analysis revealed notable differences. Females experienced a significant decrease of -6.41% (SD = 30.22, p = 0.0472), and participants <50 years had a significant decline of -10.12% (SD=30.83, p=0.0259). No significant reductions were observed in males (d = 1.99, SD = 21.89, p=0.3400) or individuals aged 50–64 (d = -0.39, SD = 26.80, p = 0.0895) or ≥65 (d=2.30, SD=20.56, p=0.3552). Compliance was not significantly affected by residual AHI (p > 0.27). Logistic regression confirmed a significant reduction in the odds of maintaining ≥70% compliance at follow-up (OR = 0.022, p = 0.001). Hierarchical linear regression showed that women <50 had the greatest compliance decline (-15.87%, p < 0.001), while older participants and males had smaller reductions.

Conclusion: These findings highlight a substantial decline in CPAP adherence over time, particularly among younger women. Initial adherence and treatment duration are key predictors of long-term compliance, while residual AHI has minimal impact. Targeted interventions, such as enhanced support and behavioral strategies, may improve long-term adherence, especially in high-risk groups.

LBA 1627

GABAergic Over-Inhibition or Excitation: Investigating Conflicting Hypotheses About Down Syndrome Sleep Deficits

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Introduction: Down syndrome (DS) affects 6 million people worldwide and results in intellectual disability and an altered sleep phenotype. Since 2007, The Heller Lab at Stanford has proposed that neuronal over-inhibition is the cause of DS intellectual disability based on their finding that GABA antagonists restore cognitive abilities of Ts65Dn mice. In parallel, the Cancedda Lab has proposed the exact opposite hypothesis that neuronal over-excitation is the cause of DS intellectual disability based on their discovery that a chloride cotransporter antagonist also restores cognitive abilities of Ts65Dn mice.

Methods: To understand the reasons for our different results, we administered a KCC2 agonist (CLP290) that decreases intracellular [Cl-] so that GABA is hyperpolarizing and inhibitory to achieve the following:

1. Test the excitatory and inhibitory GABAergic hypotheses with respect to their effects on sleep in Ts65Dn mice
2. Determine the effect of decreasing excitatory GABAergic signaling on learning/memory

Ts65Dn mice and control mice were divided into baseline (no drug), vehicle (saline), and KCC2 agonist groups in a crossover experimental design (n=25). Saline and KCC2 agonist were administered intraperitoneally. Seep was evaluated with Electroencephalogram/Electromyography electrodes and learning/memory was evaluated with Novel Object Recognition and T-Maze.

Results:

Learning/Memory:

1. Ts65Dn mice display worse short-term and long-term recognition memory compared to control mice ($p < 0.05$, 2/10/25).
2. Short-term and long-term recognition memory is significantly improved in KCC2 compared to vehicle treatment in Ts65Dn mice ($p < 0.05$, 3/15/25).

Sleep:

1. Ts65Dn mice display significantly decreased NREM and increased waking compared to control mice ($p < 0.05$, 2/15/25).
2. NREM is significantly increased and waking significantly decreased in KCC2 compared to vehicle treatment of Ts65Dn mice ($p < 0.05$, 3/12/25).

Conclusions: Ts65Dn mice demonstrate decreased NREM, increased waking, and worse short- and long-term memory than control mice. The KCC2 agonist treatment, CLP290,

increased NREM, decreased waking, and improved memory in Ts65Dn mice. We demonstrate that increasing GABAergic inhibition with a KCC2 agonist alleviated sleep and memory deficits in Ts65Dn mice. This study supports the hypothesis that intellectual disability observed in DS is caused by overexcitation of GABAergic neurons.

LBA 1628

Evaluating Impact of Rhythmic Vestibular Stimulation on Sleep Induction

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Introduction: Sleep disturbances are a modern epidemic, impacting millions of individuals across all demographics and contributing to significant mental and physical health challenges. The vestibular system's role in modulating arousal states suggests that targeted stimulation may influence sleep propensity and onset. Recent research has highlighted the potential of non-invasive vestibular stimulation to improve sleep parameters, yet controlled studies remain limited. This study uses a wearable sleep mask device to investigate the effectiveness of rhythmic galvanic vestibular stimulation (GVS) in influencing sleep.

Methods: This study investigated the effectiveness of rhythmic GVS delivered via a wearable sleep mask on sleep propensity in healthy adults (N=69, aged 18-61, mean±SD: 21.69±4.81). Using a randomized, sham-controlled design, participants underwent one of three conditions: high-intensity active stimulation, low-intensity active stimulation, or sham stimulation during a 30-minute rest period. Questionnaires, Finger Tapping Task (FTT), and Psychomotor Vigilance Task (PVT) were completed before and after to assess the impact of the rest period on subjective experience, motor memory consolidation and attention respectively. The data was collected between January to March 2025.

Results: The study demonstrated that participants in the high active (90.9%) and low active (82.1%) stimulation groups were more likely to fall asleep compared to those in the sham treatment group (56.7%) ($\chi^2 = 6.94$, $p = 0.031$). There was a significant increase in the number of successful post-nap inputs during the FTT ($p < 0.001$), with a trending effect of success influenced by sleep and condition. Additionally, a significant reduction in mean reaction time variability was observed ($p = 0.008$) in the PVT mediated by sleep. There were no statistically significant differences observed between groups for mean reaction time and accuracy rates for the PVT.

Conclusions: Rhythmic GVS shows promise as a non-pharmacological intervention for modulating sleep propensity, with effects varying based on stimulation parameters and individual sleep characteristics. These findings contribute to our understanding of vestibular-sleep interactions and support further investigation of GVS as a potential intervention for sleep difficulties.

LBA 1629

Entropy-Related Biomarkers of Sleep Disturbance in AD Mouse Model

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Introduction: The Alzheimer's disease (AD) mouse model exhibits sleep disturbances akin to those observed in AD patients. Traditional hypno-biomarkers, such as bout length, and proportion of each vigilance state, provide limited insight into pathological temporal dynamics of sleep. Advanced mathematical tools from physics offer a more complex analysis of these dynamics: 1) fluctuation analysis (FA) assesses temporal clustering of similar size of events, and 2) entropy production rate (EPR) quantifies the degree of irreversibility (entropy) and energy efficiency of the system, as irreversible heat dissipation lower efficiency. Here, we constructed entropy-related biomarkers to quantify circadian rhythm disruption and sleep fragmentation in the AD mouse model using FA and EPR.

Methods: Electroencephalograms were recorded from wild-type (WT, n=7) and 5xFAD (n=10) mice over 24 hours, with vigilance states manually scored. The δ/θ power ratio was extracted from frontal EEG every 10 seconds. FA was applied on δ/θ to compute the Hurst exponent α of each mouse, representing self-affinity of vigilance microstructure dynamics. The EPR was calculated for each mouse with transition probabilities between vigilance states.

Results: 5xFAD mice showed more sleep fragmentation and a larger difference in sleep duration between light and dark periods than WT mice. The α strongly anti-correlated with the ratio of total sleep during the dark period to the light period ($r=-0.8505$, $p=0.000012$). 5xFAD mice had higher α than WT mice ($p=0.0012$). The EPR is strongly anti-correlated with mean sleep bout lengths indicating sleep fragmentation ($r=-0.7075$, $p=0.0015$). While there was no significant group difference in EPR, three of the 5xFAD mice had prominently high EPR, suggesting their relatively low energy efficiency of the sleep-wake cycle (Date: 03/13/2025).

Conclusion: We constructed entropy-related new biomarkers to characterize the sleep-wake pattern of 5XFAD mice. FA results imply the microstructure in EEG reflects pathological macrostructure of vigilance, enabling use of fine-grained data for a biomarker. Sleep fragmentation induces energy inefficiency that might contribute to the higher body temperature of AD patients, which warrants validation with clinical data.

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LBA 1630
Mathematical Model of NREM-REM Cycle as a Thermodynamic Process

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Introduction: The empirical evidence of temperature association of sleep stage cycle has been reported across many species. Especially, small mammal, such as rodents and rabbits, has consistent trend of brain temperature in the sleep stage transition: Brain temperature decreases in NREM stage and increases in REM and Wake stages. We constructed mathematical model to explain mechanism of NREM-REM cycle as a thermodynamic process. Then, it was verified with simulating rats' experimental data and other temperature-related phenomena and characteristics in rodents' sleep were reproduced with the model.

Methods: We used D. Postnov's model of SWA induced by extracellular potassium coupling with a new term of temperature dependent neuronal excitability to construct coupled thirty-two neurons to represent all the neurons in rat's neocortex. The heat generation from stochastic neural firing and the deterministic heat dissipation made up stochastic differential equations to simulate SWA power and brain temperature dynamics with REM-NREM cycle.

We drew on spontaneously sleeping and waking rats' local field potential from bilateral hippocampus over 2 to 24 hours in The Buzsaki Lab Databank, which was acquired for Petersen et al., 2022 (n=9). We fitted the parameter of the model with the probability distribution of SWA burst durations in empirical data and verified the model by reproducing the probability distribution of REM durations of the data.

We reproduced the power-law like probability distribution of SWA burst interval and positive correlation of SWA burst interval in experimental data.

Results: The model successfully simulated the statistical property of NREM-REM cycle. Also, the model could demonstrate REM portion change depending on ambient temperature and the highest propensity to REM state in the nadir of body temperature. Additionally, characteristic long-range correlation in rat's brain signal is reproduced with the model (Date: 02/20/2025).

Conclusion: Computational Simulation considering only thermodynamic process in NREM and REM state could reproduce various empirical phenomena in sleep. It implies thermodynamic process in sleep might be crucial in proper sleep stage transition. This theoretical approach can be the base to develop thermo-therapy for sleep disorder patients.

Support (if any): None

LBA 1631
Age as a Potential Modifier of Pharmacogenetic-Guided Therapy

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Introduction: The cytochrome P450 (CYP) 2D6 enzyme metabolizes various psychotropic medications prescribed for sleep disorders, with enzymatic variability affecting both treatment efficacy and adverse effects. Pharmacogenetic testing offers a potential strategy for optimizing medication management, particularly in older populations, where age-related physiological changes can further alter drug metabolism. The CYP-GUIDES study is a RCT evaluating genotype-guided therapy in hospitalized patients with major depressive disorder. Our secondary analysis examined whether age modifies the effect of pharmacogenetic-guided treatment on length of stay (LOS).

Methods: This study included hospitalized patients with a minimum LOS of three days within a single EMR system. Patients in Group G (genotype-guided treatment) with abnormal CYP2D6 functional status (n=214) were compared to patients in Group S (standard care) with unknown functional status (n=216). A multivariable linear regression model assessed the adjusted effect of CYP2D6-guided therapeutic guidance on LOS, adjusting for gender, race/ethnicity, and the number of psychotropic medications. Separate models were conducted for younger (<65 years, n=410) and older (≥65 years, n=20).

Results: In the total population (n=430), patients in Group G had a mean LOS of 188.5 hours, compared to 194.5 hours in Group S (p = 0.686). Older patients (≥ 65 years) in Group G had a shorter mean LOS of 289.3 hours compared to 350.2 hours in Group S, representing a mean difference of -60.9 hours, though this was not statistically significant (p=0.382). In the adjusted regression analysis, patients in Group S demonstrated a trend towards longer hospital stays, although these differences did not reach statistical significance (age <65: coefficient = +12.25, p=0.386; age ≥65: coefficient = +25.39, p=0.725).

Conclusion: Older patients exhibited a greater reduction in LOS with pharmacogenetic-guided treatment. Although our findings were not statistically significant, the observed trend suggest that pharmacogenetic-guided treatment may have a meaningful impact, particularly in older adults. Further research with a larger sample size is needed to better elucidate the influence of age on pharmacogenetic-guided interventions.

LBA 1632

Sleep Bruxism, Sexual Dimorphism, and the Menopausal Transition

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Introduction: Sleep bruxism, characterized by repetitive teeth grinding, jaw clenching or bracing during sleep, is associated with micro-arousals and an increase in cardiac sympathetic activity. It affects sleep by reducing sleep efficiency and increasing sleep fragmentation and is linked to daytime fatigue and sleepiness. Given that sleep bruxism is more prevalent in women, researchers were interested in exploring differences in the signs and symptoms of sleep bruxism in women as compared to men and in women across the menopausal transition.

Methods: An observational study that concluded in March 2025 was conducted in a general dental practice to confirm whether anecdotal observations made by a dental sleep medicine specialist might be significant. Patients attending a routine dental hygiene recall appointment were asked to participate by completing a questionnaire. Their dental hygienist then performed a clinical exam and answered additional questions.

Results: The women in our sample reported significantly more teeth grinding during the day, neck pain, jaw pain upon awakening, and waking up with a headache compared to men. They also had a significantly higher prevalence of mandibular tori than men in the sample population. The relationship between sleep bruxism and sleep quality varied by stage of menopause. Women in menopause (the absence of a period for more than 12 months) reported *less* grinding during the day and at night. They also reported waking up feeling rested and alert more often than those women who reported sleep bruxism but had not yet entered menopause. Lastly, we explored the data to see if sleep bruxism among perimenopausal women predicted sleep problems above and beyond the influence of night sweats, which is often identified as a primary driver of sleep disturbance in women. Results trended in the expected direction, with a hierarchical multiple regression indicating that, accounting for night sweats, grinding at night predicted an additional 3.4% of the variance in restless sleep, although results did not reach statistical significance.

Conclusion: Understanding sleep bruxism in the context of sexual dimorphism and the menopausal transition may represent a new avenue for developing tailored interventions that improve women's sleep health.

LBA 1633

Insulin Resistance and Cardiovascular Biomarkers Differentially Moderate the Associations Between Different Sleep Stage Durations and Cognitive Impairment

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Introduction: Sleep disturbances are known to increase the risks of mild cognitive impairment and Alzheimer's disease, but the underlying mechanisms to elucidate this remain elusive. In particular, slow-wave sleep (SWS) and rapid eye movement (REM) sleep are especially important for optimal cognitive function, and disruptions in these sleep stages impede cognitive function. However, the mechanisms to explain how SWS and REM sleep disturbances hinder cognitive function are unclear. Therefore, we aimed to test how cardiometabolic biomarkers may uniquely moderate the relationships between the durations of different stages of sleep (light sleep, SWS, and REM sleep) and cognitive impairment.

Methods: Thirty-nine older adults aged 55–75 years (76.9% female) who resided in New York and Florida were invited to participate in an eight-day-long observational study between December 2024 and March 2025. Participants continuously wore a Fitbit Inspire HR wrist-worn device that measured sleep and wake activity for seven consecutive days, including the total nightly minutes of light sleep, SWS, and REM sleep. Serum cardiovascular risk biomarkers (cholesterol:high-density lipoproteins (HDL) ratio, low-density lipoproteins (LDL), triglycerides) were quantified. Serum fasting markers of insulin resistance (glucose, insulin) were also measured, from which a Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) value (an acute insulin resistance measure) was calculated. Each participant completed the Montreal Cognitive Assessment (MoCA) task, a validated screening tool to assess the extent of cognitive impairment, after the week-long study duration. Hierarchical moderated regression analysis tested how cardiometabolic biomarkers uniquely moderated the links between light sleep, SWS, and REM sleep durations and the extent of cognitive impairment.

Results: HOMA-IR values (ΔR^2=0.19, ΔF=8.56, p<0.01), but not cardiovascular risk biomarkers, moderated the link between SWS duration and MoCA scores. Contrariwise, cardiovascular risk biomarkers (cholesterol:HDL ratio (ΔR^2=0.18, ΔF=7.59, p<0.01) and LDL (ΔR^2=0.20, ΔF=9.12, p<0.01)), but not HOMA-IR values, moderated the relationship between REM sleep duration and MoCA scores. No cardiometabolic biomarkers were found to moderate the association between light sleep duration and MoCA task scores.

Conclusion: These data suggest that the mechanisms influencing the relationship between shorter sleep duration and greater cognitive impairment may differ by sleep stage. Future work should investigate these associations longitudinally.

LBA 1634

Feasibility and Acceptability of the Rest to Overcome Loss and Reduce Risk Study Plus (RESTore Plus) Study: A Pilot Trial Targeting Sleep Disturbances in Spousal Bereavement

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Introduction: Losing a spouse is a significant life event often leading to heightened stress and adverse health outcomes. Sleep disturbances are common following bereavement and can worsen existing health issues. However, interventions targeting sleep in bereaved individuals remain limited. This study assessed the feasibility, acceptability, and preliminary effects of a novel behavioral intervention addressing sleep disturbance among bereaved spouses.

Methods: Forty adults (60% female, mean age=66.4 [SD=10.9]) who lost a spouse within the last 3 months (mean days since loss 70.1 [14.6)] and had a Pittsburgh Sleep Quality Index (PSQI) score ≥5 were recruited and randomized to the novel sleep intervention (6 virtual weekly sessions, 60 minutes each) or a control condition (1 virtual sleep hygiene session, 60 minutes) between March 2023 and December 2024. The intervention was based on cognitive behavioral therapy for insomnia (CBT-I) with additional components addressing the specific needs of bereaved spouses, including psychological distress, grief rumination, and pre-sleep routine difficulties. Participants attended an in-person baseline visit (T0) and a post-intervention visit 8-10 weeks later (T1). Feasibility was assessed by recruitment rates, percentage (%) of individuals enrolled who were randomized, and retention rates. Acceptability was measured through preference ratings and % of participants completing the study protocol. Preliminary effects on sleep disturbance (PSQI) were analyzed using two-way ANOVA.

Results: The intervention showed high feasibility with a recruitment rate of 2.5 participants per month. All enrolled participants (100%) were randomized, and 100% completed the post-intervention visit. Mean acceptability ratings were 9.6 (0.9), and 95% of participants in the intervention arm completed all 6 sessions. At baseline, PSQI scores for the intervention and control groups were 9.6 (SD = 2.8) and 8.7 (SD = 3.0), respectively, and decreased to 6.7 (SD = 3.8) and 7.6 (SD = 2.7) post-intervention. A non-significant time*treatment arm trend (p = 0.087) suggested a potential reduction in sleep disturbance in the intervention group.

Conclusion: This pilot study demonstrated high feasibility, acceptability, and potential preliminary effects of the RESTore Plus intervention among bereaved adult with sleep

disturbance. The efficacy of the intervention should be determined through a large-scale randomized clinical controlled trial.

Support: This study was funded by the National Heart, Lung, and Blood Institute (5K01HL149987). ClinicalTrials.gov ID NCT05803499.

LBA 1635

"I Just Want to Sleep": Thematic Analysis of Sleep Experiences Among Homeless Individuals

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Introduction: While overnight shelters represent the most common resource for addressing difficulties faced by people experiencing homelessness (PEH), intervention strategies range from establishing tent cities or tiny home communities to the effective criminalization of homelessness. To supplement quantitative research on sleep in PEH (typically focused largely on self-reported data and skewing toward individuals in shelters), we conducted interviews with PEH in different shelter types to capture potential nuanced differences in sleep experiences.

Methods: Semi-structured interviews were conducted with 13 individuals who experienced different shelter types (e.g., sleeping rough, tent encampments, tiny houses, overnight shelter, permanent shelter). Thematic content analysis was performed on interview transcripts (in February/March of 2025) to identify themes reflecting participants' phenomenological experience of sleep. Additionally, personalized profiles of different PEH are being written to illustrate the complexity of experiencing sleep while homeless. We are currently conducting interviews with control (housed) populations to further characterize how PEH uniquely experience sleep (data currently being collected).

Results: Three core topics emerged: causes and experiences of homelessness; effects of homelessness on sleep; and resources and strategies to cope with homelessness. Multiple themes emerged within each topic, such as sleep dictating one's life, environmental challenges to sleep, and differences between shelter types. While we have just begun data analysis, preliminary results suggest the most common environmental challenges were lack of privacy and security, temperature, noise, light, and comfortable bedding. Differences between preferred shelter type were primarily due to participant personal history and how they personally dealt with the environmental challenges. The search for, as well as stability and availability of sleep spaces was often the most important factor in guiding daily routines, and emotional dysregulation was repeatedly directly linked to lack of sleep.

Conclusions: PEH describe common environmental sleep challenges, but coping strategies and shelter preferences depend on personal factors, with lack and pursuit of sleep often guiding daily routines. These findings underscore the need for qualitative research to complement quantitative methods, ensuring a more accurate and actionable understanding of homelessness and sleep that is truly helpful to those who need it most.

Support: Population Health Initiative, University of Washington

LBA 1636
Rurality and School Start Times Effect on Sleep Health in Alabama Adolescents

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Background: Adolescent sleep duration is associated with school start time (SST); however, we know little about start times and their association with geography, specifically the degree of rurality. Teens who live and attend schools in rural areas may leave earlier and get less sleep. This study assesses associations among rurality, SST, home departure times, and sleep duration in adolescents.

Methods: Eligible adolescents (N=333) completed a survey about duration and sleep onset latency (SOL). Adolescents were on average 15.52 (SD=1.29) years old and 55% female. Race was 35% Black and 55% White. Early vs. late SST were classified as before or after 7:45, about half had early SST. Rurality was evaluated from 1-3, with lower scores being more urban. Public school students made up 96% of the responses. Associations were assessed with correlations and univariate analysis of variance. Data collection took place from March 2022 to February 2025.

Results: Among all youth, average duration was 424 minutes (about 7 hours; SD=74.75) and average SOL was 39 minutes (SD=44.52). Teens with early start times had higher degrees of rurality ($r = -.338$, $p < .001$). Rurality was also associated with earlier departures from home ($r = -.176$, $p = .001$). Sleep duration and rurality were non-linearly related ($F(2,328) = 3.128$ $p = .045$). Teens in urban areas had more sleep than those in urban adjacent areas. The most rural (albeit smaller n) had the most sleep. Sleep duration and SOL did not differ between early and late SST (p's > .05).

Conclusion: Among diverse youth in the Deep South, more rurality was associated with earlier SST and earlier leave times. It is likely that teens who already wake up for earlier SST have to also factor in additional time in the mornings for their commute based on their rurality. Findings indicate that rurality should be taken into consideration when establishing SST in order to prioritize youth sleep health. Interestingly, sleep duration and sleep latency were not associated with SST. Thus, it will be important to explore other potential circadian effects of early start times and leave times.

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LBA 1637

Characterizing Sleep Coercion and Impacts of Intimate Partner Violence on Sleep Health and Mood Among Latina Survivors

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Introduction: Over 30% of Latina women report insufficient sleep. Limited research examines sleep among intimate partner violence (IPV) survivors, particularly Latina survivors. IPV research has focused on physical, sexual, and psychological abuse. Abusive partners may also attempt to restrict, interrupt, monitor, or control women's sleep. We conceptualize "sleep coercion" as a previously unstudied type of IPV involving violent or controlling behaviors that intentionally target or impact sleep. We conducted qualitative interviews and quantitative surveys with Latina IPV survivors to characterize sleep coercion and to explore impacts of IPV on sleep and mood.

Methods: Bilingual staff conducted qualitative interviews with Latina adults aged 18+ who reported ongoing/prior IPV. Women completed 1-2-hour interviews via Zoom/phone (July-Oct 2024). Interviews were audio-recorded and transcribed; translation and coding are ongoing. Women completed Spanish-translated surveys on cognitive/behavioral fears around sleep (Fear of Sleep Inventory, FoSI-1; range: 0-92, higher=worse), sleep-related traumatic events and nighttime vigilance (FoSI-2), and symptoms of depression (PHQ-9≥10), anxiety (GAD-7≥10), and post-traumatic stress disorder (PTSD; PCL-5≥30).

Results: Participants included 11 women aged 19-45 [*M*(*SD*)=32.7(7.3)]. Considering qualitative results, all 11 women described some exposure to sleep coercion. Preliminary themes include: (1) sleep is unsafe (*"I [never] felt like sleeping"*); (2) need for vigilance ("*I'm like conscious and asleep"*); (3) intentional violence during sleep (e.g., strangulation, sexual assault); (4) sleep routines dictated by the abusive partner *("I wasn't allowed to decide [when to sleep]"*); and (5) fears before bed *("He said things before bed to provoke a fight"*). Seven of the 11 participants completed self-report surveys. Women reported modest fears around sleep [*M(SD)*=24.3(18.6)]. Over 70% of women (71.4%) reported trauma/vigilance related to the bed, the dark, or sleep. Over half of women (57.1%) reported elevated anxiety or PTSD symptoms. All participants (100%) reported elevated depressive symptoms, with 57.2% of women scoring in the moderately severe to severe range.

Conclusion: Findings from this novel mixed-methods study provide initial support for the concept of sleep coercion. Poor sleep quality, sleep-related fears, and vigilance are prevalent among Latina IPV survivors. We will share strategies for language equity in IPV and sleep research.

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LBA 1638

Impact of Benzodiazepine Receptor Agonist Masked Tapering Combined with Augmented CBTI on Daytime Sleepiness and Patient-Reported Sleep Quality

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Introduction: Many older adults with insomnia who use benzodiazepine receptor agonists (BZRAs) struggle to discontinue using their BZRA. We created the Masked Taper plus cognitive behavioral therapy-augmented program (MTcap) to target placebo effects, which are observed in BZRA trials, and recently reported that MTcap results in greater BZRA discontinuation 6 months after treatment (73.4%) compared to cognitive behavioral therapy for insomnia (CBTI) and supervised gradual (unmasked) taper (SGT; 58.6%). Both groups demonstrated improved insomnia severity. In January 2025, we expanded our analyses to assess the impact of MTcap versus SGT on daytime sleepiness and sleep quality.

Methods: A multi-site trial was conducted at an academic health center and Department of Veteran Affairs medical center in California. Adults (>=55 years) who used alprazolam, lorazepam, temazepam, and/or zolpidem for >= two nights per week >= three months were randomized to receive 8 sessions of MTcap or SGT. Blinded research staff members administered the Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI) at baseline, 1-week post treatment (PTX), and 6 months following treatment (6M). Using two-level mixed-effects models, we predicted ESS and PSQI total score as a function of treatment group, site, treatment-site interaction, and time.

Results: 188 participants (mean age 69.2 years, 34.6% female, mean frequency 5.9 days/week BZRA use) were randomized (MTcap n=92, SGT n=96), with PTX and 6M questionnaire follow-up rates of 94.1% and 91.5%, respectively. There were no significant differences between treatment groups in PSQI total score and ESS from baseline to PTX and 6M (p-values > .43)—ESS scores improved ($p < 0.001$) in both groups from baseline (SGT =6.21, MTcap=6.32) to PTX (SGT=3.92, MTcap=3.98) and 6M (SGT =3.91, MTcap = 4.54). Additionally, PSQI total scores improved ($p < 0.001$) from baseline (SGT =12.47, MTcap=12.10) to PTX (SGT=7.39, MTcap=7.26) and 6mo (SGT =7.92, MTcap = 7.55).

Conclusion: Participants in MTcap and SGT groups demonstrated improvement in ESS and PSQI scores despite more participants in MTcap group discontinuing BRZA use at follow-up. These findings could be attributed to the impact of CBTI (common to both groups) on sleep quality and daytime function.

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LBA 1639

Screening for Idiopathic REM Sleep Behavior Disorder Using a Synucleinopathy Prodrome Questionnaire and Machine Learning

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Introduction: Synucleinopathies, including Parkinson's disease, dementia with Lewy Bodies, and Multiple System Atrophy are common yet challenging to detect in their prodromal stages. REM behavior disorder (RBD) is an early prodromal marker and strong predictor of synucleinopathy with >80% of patients phenoconverting within 10 years of diagnosis. A staged approach for screening RBD and prodromal synucleinopathy could combine a questionnaire on RBD symptoms *plus* (RBD+) other prodromes, followed in screen-positive individuals by further screening using wearables or biological markers. Our goal was to develop a machine learning (ML) classifier for detecting RBD+ as a first stage in such a screening paradigm.

Methods: We developed the "RBD+" questionnaire, an 11-item questionnaire, to screen for RBD symptoms, subjective hyposmia, autonomic symptoms (dry mouth, constipation, orthostatic dizziness, sexual dysfunction), anxiety, depression, visual hallucinations, memory and balance concerns. For each item, participants answered 'YES,' 'NO,' or 'DON'T KNOW.' The questionnaire was administered in our research cohort, including 26 with idiopathic RBD (iRBD) and 18 controls without RBD or neurodegenerative disease, and in 66 consecutive patients (15 iRBD and 51 controls) aged >40 seen in a neuro-sleep and general sleep clinic. The entire cohort included 110 participants, 41 cases (71.78 years ±6.94 SD, 60.97% male) and 69 controls (63.77 years ±12.67 SD, 56.52% male). This data was analyzed beginning 03/03/2025. In the control group, the most prevalent diagnoses were obstructive sleep apnea (61%), restless leg syndrome (24%), insomnia (19%), depression (13%), anxiety (8%), hypersomnia (8%), and parasomnias (4%). We developed and compared the performance of ML classifiers using questionnaire data to detect iRBD.

Results: The most discriminating questions were on RBD symptoms (sensitivity 0.707, specificity 0.666), subjective hyposmia (sensitivity 0.439, specificity 0.652) and hallucinations (sensitivity 0.122, specificity 0.956). An optimized random forest classifier had the highest performance with AUC 0.868, accuracy 0.855, sensitivity 0.707 and specificity 0.942.

Conclusion: Our RBD+ questionnaire robustly differentiated RBD from other sleep or neuro-sleep disorders using ML, which greatly enhanced specificity compared to the single RBD question and outperformed the accuracy of any single question. Future work should validate the approach in a larger sample to investigate its usefulness as a screening tool.

LBA 1640

The Role of Norepinephrine and Sleep Deprivation on Cerebrovascular Oscillations in Humans

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Introduction: Cerebrovascular oscillations play a crucial role in driving cerebrospinal fluid flow into and through the brain parenchyma, facilitating the clearance of waste products. While previous studies suggest that these oscillations are influenced by sleep-wake cycles and autonomic arousal, the precise nature of this relationship remains poorly understood.

Methods: To examine the role of vigilance and norepinephrine in modulating cerebrovascular oscillations, we studied 20 healthy individuals, aged 18–29 years, in a circadian-controlled approach. Participants underwent simultaneous EEG recording and accelerated neuroimaging with the multiband echo planar imaging (MB) magnetic resonance sequence during three distinct states: rested wakefulness, sleep-deprived wakefulness, and sleep-deprived NREM sleep (stages N2 and N3). The resulting image time series were analysed using spectral analysis, with whole-brain MB spectral power within the low frequency oscillation (LFO) band (0.011–0.034 Hz) considered a measure of cerebrovascular oscillations. Effects of sleep deprivation and sleep were evaluated using linear mixed models, with 'vigilance state' (awake vs. sleep) and 'sleep deprivation status' (rested vs. sleep-deprived) as fixed effects and 'participant ID', 'scan day' and 'scan session' as nested random intercepts. Pearson's correlation coefficients were used to assess associations between plasma NE (p-NE) levels and MB spectral power.

Results: MB spectral power in the LFO band was greater during sleep-deprived wakefulness than during both rested wakefulness (+91%, $p < 0.001$) and sleep-deprived sleep (+79%, $p = 0.011$). In rested wakefulness, LFO power was positively correlated with p-NE ($r = 0.59$, $p = 0.022$). This relationship persisted during sleep-deprived sleep, as changes in p-NE from rested to sleep-deprived conditions correlated with changes in LFO power from rested

wakefulness to sleep (r = 0.68, p = 0.044). However, the heightened LFOs during sleep-deprived wakefulness did not correlate with p-NE or changes in p-NE, nor could they be explained by increased autonomic arousal (no significant differences between rested and sleep-deprived wakefulness in blood pressure, respiration rate, or heart rate: $p_{all} > 0.05$).

These results emerged from data analyses conducted in December 2024.

Conclusion: Cerebrovascular oscillations are modulated by two distinct factors: heightened sleep pressure and sympathetic activity.

LBA 1641

Genetic and Proteomic Signatures of Eveningness are Associated with Lower Risk of Dementia and Better Cognitive Resilience in Older Adults from the ROSMAP Study

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Introduction: Eveningness is partly determined by the genome and has been associated with better cognition, but the underlying mechanisms is unknown. The impact of eveningness on Alzheimer's disease (AD) and related dementia, neuropathology, and cognitive resilience (CR) are poorly understood.

Methods: We included 3,057 participants who completed at least one sleep questionnaire (n=1,040) or had genotyping (n=2,617) or brain proteomics (n=850; >8,000 proteins measured in dorsolateral prefrontal cortex tissues using Tandem Mass Tag Mass Spectrometry) data from the Religious Orders Study and Rush Memory and Aging Project (data received on 01-12-2025). Polygenic risk scores (PRS) of eveningness were calculated using a Bayesian framework-based approach based on summary data from a published genome-wide association study of accelerometer-derived timing of least-active 5 hour (L5), most-active 10 hour (M10), and sleep midpoint (SMP). Elastic net with leave-one-out cross-validation was used to construct proteomic signatures for PRSs of eveningness. Cognitive function and dementia diagnosis were assessed annually through death by clinicians using 19 cognitive tests. Neuropathology (i.e., AD, cerebrovascular, and other neurodegenerative pathology) was evaluated in post-mortem brain. CR was defined as a better-than-expected cognition given the degree of neuropathology. Logistic or linear regression was used to examine associations between PRSs of eveningness and their proteomic signatures with dementia, neuropathology, and CR.

Results: Every standard deviation increase in the PRSs of eveningness was associated with 5.2-8.5 minutes later in self-reported bedtime and SMP ($p<0.03$), as well as lower risk of dementia (OR=0.90; P=0.02) and better CR (β=0.04; P=0.007). Brain proteomic signatures were identified for the PRSs of M10 (consisting of 44 proteins) and SMP (49 proteins), but not for L5. Proteins with a positive weight (promoting later timing) are enriched in ion channels, endosome functions, and protein transportation, while proteins with a negative weight (promoting earlier timing) are enriched in fatty acid metabolism and adipocytokine signaling. The proteomic signature for PRS of M10 was associated with lower risk of dementia (OR=0.80; P=0.04), lower levels of beta-amyloid and tau tangles ($\beta<-0.14$; $p<0.3$), and better CR (β=0.01; P=0.74).

Conclusion: Brain biological pathways related to eveningness may contribute to preserving cognitive functions against age-related accumulation of neuropathology.

LBA 1643

Characterizing Sleep Problems in Adolescents and Young Adults with Intellectual and Developmental Disabilities Living in Rural Areas

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Introduction: Sleep disturbances are among the most prevalent comorbidities in intellectual and developmental disabilities (IDDs) and represent a promising target for developing new therapeutic strategies that may impact multiple developmental functions. Few studies have focused on understanding sleep behaviors in adolescents and young adults with IDDs making it difficult to draw solid conclusions regarding sleep-related issues that should be targeted. Notably, individuals with IDDs living in rural communities may have unique risk factors for sleep disorders and are historically underrepresented in research studies. The present study leveraged electronic health record (EHR) data to investigate sleep disturbances across four IDD conditions.

Methods: Diagnostic codes were used to identify patients with IDD conditions (i.e., Angelman [ICD10: Q93.5], Fragile X [ICD9: 759.83, ICD10: Q99.2], Prader-Willi [PWS; ICD9: 759.81, ICD10: Q87.11], and Rett [ICD9: 330.8, ICD10: F84.2] syndromes); patients were defined based on ≥2 codes on different dates. Individuals with multiple diagnoses and a qualifying diagnosis after age 18 were excluded. Additional EHR-derived data from individuals who were between 13-25 years old were analyzed to identify sleep-related ICD codes. Data were compared between individuals living in urban versus rural areas based on Rural-Urban Commuting Area (RUCA) codes with RUCA codes>6 considered rural.

Results: The breakdown of patients identified by site was as follows: Kansas (Angelman [n=3], Fragile X [n=36], Rett [n=47], PWS [n=49]); Kentucky (Angelman [n=24], Fragile X [n=55], Rett [n=33], PWS [n=18]), Iowa (Angelman [n=39], Fragile X [n=133], Rett [n=81], PWS [n=89]). Most patients (73-93%) had urban designations. Many individuals with IDDs (44-56%) had co-occurring codes for sleep disorders; sleep apnea was the most prevalent (12-65%), followed by sleep-related gastroesophageal reflux disease (33%) and insomnia (32%). Sleep-related codes were more prevalent for patients with PWS.

Conclusion: EHR-derived data indicates that adolescents and young adults with IDD-related genetic syndromes are more often evaluated for sleep apnea compared to other sleep disorders. Individuals residing in rural areas are less likely to be seen at the health centers evaluated. This highlights issues related to rural healthcare access and a need for community engagement activities to build trust and inform patients and caregivers about the importance of healthy sleep.

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LBA 1644

Genome-Wide Association Study of Insomnia Implicates a Novel African Ancestry-Specific Locus in the All of Us Research Program Cohort

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Introduction: Approximately 40% of adults have reported experiencing one or more symptoms of insomnia, a complex phenotype, with both genetic and environmental contributions. However, most insomnia genome-wide association studies (GWASes) to date rely only on simple self-report instruments and have been conducted on individuals of European decent. To address this gap, we used data from the *All of Us* research program to conduct a GWAS of insomnia by leveraging health records data on individuals across diverse ancestry groups.

Methods: In February 2025, we examined *All of Us* participants with available survey, electronic health record, and whole genome sequencing data. Flexible and stringent clinical insomnia phenotypes were defined, using combinations of physician-identified clinical codes, insomnia medication prescriptions, and survey data. Genome-wide associations were analyzed in groups of participants defined by their ancestry.

Results: A total of 206,173 participants were analyzed, with 52.1% of the participants being of European, 21.0% of African, 15.8% of admixed American, 1.9% of East Asian, 1.0% of South Asian, 0.2% of Middle Eastern genetic ancestry, and 8.0% were not assigned a specific ancestry based on their genetic data (Other). The average age was 57.1 (SD=16.9) years and 123,973 (60.1%) of the participants were female at birth. There were 31,963 (15.5%) individuals that met the criteria for flexible and 18,426 (8.9%) for stringent definition of insomnia. Preliminary results using the stringent phenotype in individuals of African genetic ancestry (cases: 3,195 controls: 40,060) identified four genome-wide

significant associations ($p<5.0x10^{-8}$). The variants 18:52373144:T:C (β=-0.18; SE=0.03; $p=6.5\times10^{-9}$), 18:52382356:G:A (β=-0.17; SE=0.03; $p=2.1\times10^{-8}$), and 18:52389040:A:G (β=-0.17; SE=0.03; $p=2.2\times10^{-8}$) are located within the *DCC* gene that has been previously reported to be associated with insomnia. The variant 19:52372290:A:AT (β=-0,17; SE=0.04; $p=3.15\times10^{-8}$) has not previously been associated with insomnia and is located within *ZNF880*, a zinc finger transcription factor.

Conclusion: Our study both replicates prior findings using a novel EHR insomnia phenotype and suggests a novel ancestry-specific genetic locus associated with insomnia. These results highlight the importance of incorporating more diverse individuals in genetic association studies of sleep disorders.

Support: All of Us Research Program is supported by the NIH, Office of the Director.

LBA 1649

The Role of Hypoxic Burden Optimizing Titration of Hypoglossal Nerve Stimulation Therapy for Obstructive Sleep Apnea

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Introduction: Hypoglossal nerve stimulation (HGNS) is an effective therapy for moderate-severe obstructive sleep apnea (OSA), yet optimal titration remains a challenge. The apnea-hypopnea index (AHI) is traditionally used to assess treatment response but does not fully capture the physiological burden of OSA. This study evaluated whether hypoxic burden (HB, %min/hr), the cumulative burden of oxygen desaturation during sleep, is a valid alternative to AHI for tracking progress during HGNS titration.

Methods: This retrospective study analyzed 120 patients (88 Males, 32 Females; Age: 64.1 ± 11.7 years; BMI (kg/m2): 27.9 ± 3.8) who underwent HGNS titration from January 2023 to January 2025. During titration, routine home sleep apnea tests (HSAT) were used to monitor sleep metrics, including AHI and HB (Mean HSATs Per Patient: 12.83 ± 9.26). The primary outcome was the ability of each metric to predict treatment improvement over time. Correlation analysis, regression modeling, and time-series analysis were performed to assess their predictive value. Subgroup analyses examined differences by gender and body mass index (BMI).

Results: There was moderate positive correlation between AHI and HB ($\rho = 0.655$, $p < 0.001$), suggesting some overlap but also independent contributions. Regression analysis demonstrated overall that HB improvement was more predictable ($R^2 = 0.57$) than AHI improvement ($R^2 = 0.31$). HB also improved more consistently over time compared to AHI, which exhibited fluctuations. Gender-specific trends revealed that HB was the strongest predictor of improvement in females ($R^2 = 0.85$), while AHI had a weaker predictive value ($R^2 = 0.25$). In males, HB remained more stable, with a moderate predictive advantage over AHI ($R^2 = 0.64$ vs. 0.41). BMI-stratified analyses showed that in obese patients (BMI ≥30), HB demonstrated a stronger predictive value for sustained improvement compared to AHI ($R^2 = 0.57$ vs. 0.10).

Conclusion: HB is a more reliable and stable indicator of OSA improvement during HGNS titration compared to AHI. While AHI provides early feedback, its variability makes it less suitable for long-term tracking. HB should be prioritized in titration decisions, particularly in females and higher BMI patients, where it provides stronger predictive value.

LBA 1650

Predictors of Elevated Cardiovascular Risk in Obese Patients Tested for Obstructive Sleep Apnea Before Weight Loss Therapy

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Introduction: Obstructive sleep apnea (OSA) and obesity are well-established contributors to cardiovascular disease, yet their individual and combined effects on cardiovascular risk remain unclear. A mean nocturnal heart rate >60 beats per minute (BPM) has been identified as a marker of increased cardiovascular risk, associated with a higher incidence of hypertension, arrhythmias, and heart failure. This study aimed to determine the key predictors of cardiovascular risk in obese patients before initiating weight loss therapy.

Methods: We analyzed home sleep apnea test data from 642 obese (Body Mass Index (BMI): >30 kg/m^2) patients (Males: 151, Age: 40.3 ± 10.8 years, BMI: 41.8 ± 7.1; Females: 491, Age: 40.8 ± 10.5 years, BMI: 41.6 ± 7.3) tested from 2024, before initiating weight loss therapy. Demographic and sleep study variables were assessed to assess cardiovascular risk (age, sex, BMI, Apnea/Hypopnea Index (AHI: total, supine, non-supine, REM, and non-REM), hypoxic burden (%min/h), SpO_2, T90, snoring %, sleep efficiency %, and total sleep time (TST)). Logistic regression was used to determine significant predictors of high cardiovascular risk (mean bpm > 60).

Results: Overall, significant predictors of increased cardiovascular risk included an elevated REM-AHI ($OR > 1$, $p < 0.01$), lower SpO_2 nadir ($OR < 1$, $p < 0.05$), and low sleep efficiency ($OR < 1$, $p < 0.001$). For males, shorter TST ($p < 0.05$) was the only statistically significant predictor. For females, lower sleep efficiency ($OR < 1$, $p < 0.001$) was the dominant risk factor, along with higher REM-AHI ($OR > 1$, $p < 0.05$), and older age ($OR < 1$, $p < 0.05$), suggesting age-related cardiovascular vulnerability in women. A higher sleep efficiency was found to be protective.

Conclusion: Our findings emphasize the importance of identifying sleep-related cardiovascular risks in obese patients before weight loss therapy, as untreated OSA may hinder metabolic improvements and cardiovascular benefits from weight reduction. Since men and women exhibit distinct risk patterns, targeted sleep interventions, such as optimizing TST in men and improving sleep efficiency and REM-AHI in women, could enhance overall health outcomes. Addressing these sleep factors preemptively may improve both weight loss success and long-term cardiovascular health.

LBA 1651

Does the Placebo Run-In Protocol Eliminate or Minimize Placebo Effects In Rcts

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Introduction: To conduct an archival analyses of placebo effects as they occur following a placebo run-in protocol. Data were derived from a Phase 3 study of lemborexant (E2006-G000-303;NCT02952820).

Methods: All included subjects met DSM-5 criteria for insomnia disorder, were ≥18 years of age, and had: (1) a TIB of between 7 and 10 hours; (2) sleep diary-based SLs ≥30 minutes and/or WASOs ≥60 minutes (on ≥3 days / week for the past month); and (3) an ISI score ≥15.

Clinical status was monitored with sleep diaries and the ISI. The "run-in" phase of the trial included a 7-day baseline period (monitoring only period) and a 7-17 day, single blind, placebo treatment period. Subjects who failed to meet study inclusion criteria following the placebo run-in were not randomized. In the present analyses, placebo responses were assessed following the run-in phase and monthly over six months' time. Placebo response was defined (post hoc) as $\geq$ 50% reductions in SL, WASO, or EMA at each monthly assessment. Generalized estimating equations were used to model response rates over time. Models included time (months from randomization) and were adjusted for potential confounding variables (age, sex, race, and BMI).

Results: 1,341 individuals were entered into the monitoring only period and the placebo run-in phase. 370 were excluded. Of the 370 people excluded, 65 were discontinued because they no longer met the study criteria for insomnia. Thus, 5% of subjects were excluded based on the placebo run-in protocol. Following randomization, model-based placebo response rates ranged from 28% to 43% of subjects over the 6-month follow-up period. Response rates differed by age, with younger adults exhibiting 3.3 greater odds of placebo response as compared to older adults (95% CI=1.7,6.5). The effect did not differ by time (Chi-square (df=6)=9.82, p=0.13).

Conclusions: This secondary analysis clearly shows that placebo effects are not eliminated via the use of a placebo run-in protocol (detection and removal of placebo responders within the first 2-4 weeks of a trial). These findings are consistent with prior work showing that placebo run-in protocols do not eliminate placebo responding in depression trials.

LBA 1652

The Use of a Non-Intrusive Under-Mattress Sleep Analyzer in Home Monitoring of Patients Under Continuous Positive Airway Pressure

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Introduction: to determine the performance of the WITHINGS Sleep Analyzer (WSA) in the evaluation of sleep duration and respiratory events, we compared WSA data with CPAP use, residual events and polysomnographic data in patients with CPAP treatment.

Methods: The WSA (CE medical and FDA certified) placed between the bed base and the mattress, records pressure variations and snoring. Between 2022/12 and 2024/12 it was set up in the patient's home. Simultaneous 7-daily reports from CPAP Airsense (Resmed) and WSA were collected. In addition 14 patients had simultaneous recordings of CPAP and WSA under full PSG at home. Patients and home care providers did not receive feedback from the WSA during the protocol.

Results: 75 patients (17F) with a diagnosis of OSAS, mean age 55.1 years (SD 12.1), BMI 30.8 kg/m^2 (4.7), Epworth Sleepiness Scale 11.2 (5.4), AHI (Apnea-Hypopnea Index) 44.2/hr (20.5) had 480 nights of concurrent WSA and CPAP recordings. Time spent in bed was 8.1 hr (1.2) and sleep time 7.1 hr (1.2) for an average duration of CPAP use of 6.5 hr (1.7) (Wilcoxon test comparison of sleep time WSA vs CPAP $p<0.001$). The AHI determined by the WSA was 11.3/hr (12.4) vs 2.0 (1.9) for CPAP ($p <0.001$). In the 14 patients recorded with PSG, AHIpsg was 10.9/hr (8.4) compared to AHIwsa 8.8 (10.9) and AHIcpap 2.9 (2.7) ($p<0.05$ between PSG and WSA, WSA and CPAP; $p<0.01$ between PSG and CPAP).

Conclusion: In this highly adherent patient group, WSA allowed to evaluate Time in bed,Total sleep time and AHIwsa. With CPAP, AHIwsa was higher than AHIcpap and close to AHIpsg. In the future WSA could improve CPAP follow-up with better therapy efficacy assessment particularly during the early phase of treatment. WSA may also increase patient empowerment.

Support: PE is consultant for WITHINGS, RY Yang is employee of WITHINGS, KA was employee of SOS oxygene (Home Care Provider), OF is CEO of Somniplanet (Home Care Provider)

LBA 1653
Many Custom Oral Appliances May Not Meet the Definition of Custom

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Introduction: The AASM's 2015 Clinical Practice Guidelines (CPG) for Oral Appliance Therapy define custom oral appliances (OAs) as: "fabricated using digital or physical impressions and models of an individual patient's oral structures" and "not a primarily prefabricated item that is trimmed, bent, relined, or otherwise modified". However, many OAs marketed as 'custom' feature prefabricated components. The purpose of this analysis was to determine if the definition of 'custom' from the current CPG effectively describes, classifies and differentiates OAs for the treatment of OSA.

Methods: Data from a previous review article were analyzed on March 3, 2025, to determine which categories of custom OAs conform with the existing AASM CPG definition of 'custom'. OAs were labeled as 'custom' if they were entirely crafted from a patient's oral records with no prefabricated components. Devices were labeled as 'semi-custom' if they were crafted from oral records but included prefabricated components.

Results: 27 records were reviewed, yielding six categories of OAs that are all currently marketed as 'custom'. The six categories were: Lateral Push, Lateral Pull, Interlocking Flange, Block, Anterior Pull and Precision Post. Only the Precision Post category fully satisfied the AASM CPG definition of a custom OA. Five categories (Lateral Push, Lateral Pull, Interlocking Flange, Block and Anterior Pull) did not meet the definition due to the inclusion of prefabricated components.

Conclusions: The classifications of 'custom' and 'non-custom' OAs found in the current AASM CPG do not appear to be exclusive or exhaustive, as most commercially available OAs marketed as 'custom' do not meet the definition. This analysis demonstrates that further granularity is necessary to more effectively differentiate among OAs and that there is an argument for a 'semi-custom' classification for OAs that are partially made from a patient's oral records but include prefabricated components. True custom OAs might perform differently from semi-custom OAs. Modifications, compromises, and deviations from the optimal patient-specific design are often required to incorporate prefabricated components. Such modifications could affect comfort, efficacy, side effects, durability, patient satisfaction, and other characteristics associated with successful treatment outcomes.

LBA 1654

Suvorexant's Effect on Sleep in Female and Male C57BL/6 Mice During Nicotine Abstinence

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Introduction: Nicotine withdrawal disrupts sleep, with females experiencing greater disturbances than males. Poor sleep during withdrawal increases relapse risk, making effective interventions essential.

The orexin system regulates both sleep-wake cycles and drug-seeking behavior. Nicotine withdrawal disrupts orexin signaling, leading to hyperarousal, cravings, and sleep disturbances, all of which heighten relapse risk.

Suvorexant, an FDA-approved dual-orexin receptor antagonist for insomnia, improves sleep during opioid withdrawal. Other orexin receptor antagonists have shown that orexin signaling is essential for nicotine addiction in rodents. Given orexin's role in nicotine dependence, this study investigates suvorexant's effects on sleep in male and female mice during nicotine abstinence.

Methods: To determine sleep-wake behavior, physiological parameters from adult male and female C57BL/6 mice (studied February and March 2025) were recorded using a non-invasive piezoelectric cage system. Food and water were provided ad libitum. Following a seven-day acclimation period, baseline sleep was recorded for 48 hours. Nicotine dependence was induced via osmotic mini-pumps (25 mg/kg/day for 12 days), implanted at ZT0 and removed at ZT23 to initiate nicotine abstinence. Mice received either suvorexant (30 mg/kg) or a vehicle control (0.5% methylcellulose solution) via oral gavage at ZT0 on Abstinence Days 1 and 2 (AD1, AD2).

Results: On AD2, female mice treated with suvorexant exhibited a significant increase in total sleep within the first three hours post-gavage, restoring sleep to baseline levels. In contrast, vehicle-treated controls displayed persistent sleep disturbances. Sleep transition analysis within females revealed no significant differences between treatment groups (February 2025). Data from male mice is currently being analyzed and will be discussed.

Conclusions: These findings suggest that suvorexant effectively restores sleep in female mice undergoing nicotine abstinence. Given the strong link between sleep disturbances and relapse, further research is warranted to evaluate suvorexant's potential as a therapeutic intervention for nicotine withdrawal-induced sleep disruptions. Targeting the orexin system may provide a novel approach to addressing both sleep and addiction-related challenges during nicotine cessation.

LBA 1655
Evaluation of Dreem 3S for Sleep Monitoring in Narcolepsy Type 1

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Introduction: Narcolepsy type 1 (NT1) is a rare neurologic disorder characterized by excessive daytime sleepiness, cataplexy, hallucinations, sleep paralysis, and disrupted nighttime sleep. In-clinic polysomnography (PSG) and multiple sleep latency tests (MSLTs) are recommended for assessing pathological sleep for NT1 diagnosis and in clinical trials. They require substantial patient time and trained personnel costs but are unable to capture sleep variability across nights and may not reflect a natural sleep environment. NCT06531876 is a prospective clinical validation study evaluating Dreem 3S, an FDA-cleared at-home dry-electrode electroencephalography device, in participants with NT1 to understand wear compliance, data quality, and sleep staging accuracy.

Methods: Following availability on January 31, 2025, data from 28 participants with NT1 were analyzed. NT1 diagnosis was based on the presence of cataplexy and positive MSLT, as determined by investigator. Participants recorded six nights of at-home sleep with Dreem 3S, followed by two nights of in-clinic PSG with concurrent Dreem 3S. At-home wear compliance was measured by algorithmically detected “on-head” device wear time and data quality was assessed using the Dreem 3S “scorability” algorithm. In-clinic PSG was scored by three Registered Polysomnography Technologists (RPSGTs). In-clinic Dreem 3S data were automatically scored using a proprietary sleep-staging algorithm and results were adjudicated by three RPSGTs.

Results: At-home wear compliance and data quality benchmarks were met: ≥85% of participants had ≥4 overnight recordings with ≥4 hours of wear time and 85% of data being "scorable". On average, participants met compliance and data quality criteria on 5.54 (SD 0.69) out of six nights. Sleep staging agreement between adjudicated Dreem 3S and PSG was high across sleep stages, with mean overall/positive/negative agreement of 95.8/88.2/96.8% for wake, 95.4/47.7/98.5% for non-rapid eye movement (NREM) N1, 90.5/86.4/93.0% for NREM N2, 96.4/90.5/96.8% for NREM N3 and 94.9/84.9/96.6% for REM. Unadjudicated Dreem 3S and PSG agreement was similarly high.

Conclusion: These preliminary results are supportive of exploring the use of Dreem 3S to quantify sleep stages in NT1 in both clinic and at-home settings. Dreem 3S has potential to

be used for monitoring sleep longitudinally in a patient's home, thereby reducing overall burden and cost.

Support: Funded by Takeda and Beacon Biosignals.

LBA 1656

Social Determinants of Health and Clinical Burden in Narcolepsy: A Retrospective Cohort Analysis

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Introduction: While the clinical burden of narcolepsy is well documented, the impact of social determinants of health (SDoH) on this population remains poorly understood. We aimed to identify demographic and clinical characteristics of individuals with narcolepsy, focusing on SDoH and health disparities.

Methods: A retrospective, observational study was conducted using electronic health records (EHR) and survey data from the All of Us Research Program. Individuals with narcolepsy were identified using SNOMED codes (1/1/2009–1/31/2022); index was defined as the earliest diagnosis date. Non-narcolepsy participants met inclusion criteria and were matched 3:1 to those with narcolepsy by age, sex, earliest EHR record, time in EHR, and SDoH survey completion. Descriptive statistics and multivariable logistic regression analyses were completed in 02/2025 to summarize clinical comorbidities (from EHR) and survey data (including demographics and SDoH measures).

Results: In total, 2766 participants (narcolepsy: n=694; non-narcolepsy: n=2072) were identified, with a mean age of 49 years; 70% were female. Participants reported high education levels (at least some college education: narcolepsy: 80%; non-narcolepsy: 70%); however, a larger proportion of narcolepsy versus non-narcolepsy participants were out of work/the workforce (39% vs 29%, respectively). Cost-related barriers to care (75% vs 61%) and disability (51% vs 30%) were more frequently reported by narcolepsy versus non-narcolepsy participants. Among respondents who completed the additional SDoH survey (narcolepsy: n=259; non-narcolepsy: n=768), food insecurity was more prevalent in narcolepsy participants (28% vs 16%). Narcolepsy participants also reported higher levels of loneliness, everyday and medical discrimination, and lower levels of social support and cohesion. Hypertension (38% vs 29%) and heart failure (7% vs 3%) prevalence at index was higher among narcolepsy versus non-narcolepsy participants. Participants with narcolepsy also had higher odds (odds ratio [95% confidence interval]) of a cardiovascular (1.91 [1.54–2.36]), cardiometabolic (2.12 [1.73–2.59]), and cardiorenal (2.47 [1.72–3.56]) comorbidity compared with non-narcolepsy participants.

Conclusions: Narcolepsy is associated with social and clinical challenges, including employment barriers, SDoH-related disparities, and higher burden of comorbidities. Comprehensive and timely narcolepsy management strategies are warranted to address whole-person health, including comorbidities and social factors that may influence access to care and health outcomes.

Support: Jazz Pharmaceuticals.

LBA 1657

Real-World, Participant-Reported Effectiveness and Satisfaction with Low-Sodium Oxybate in Idiopathic Hypersomnia

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Introduction: Low-sodium oxybate (LXB; Xywav®) is approved by the US FDA to treat idiopathic hypersomnia (IH) in adults and excessive daytime sleepiness (EDS)/cataplexy in patients aged ≥7 years with narcolepsy. The CHIME study examined real-world patient-reported adherence, effectiveness, and satisfaction among adults with IH or narcolepsy (reported separately) taking LXB.

Methods: A cross-sectional online survey with validated patient-reported outcome measures (Epworth Sleepiness Scale [ESS; range 0–24], Idiopathic Hypersomnia Severity Scale [IHSS; range 0–50], Visual Analog Scale–Sleep Inertia [VAS-SI; range 0–100], Patient Global Impression of Change [PGI-C]) and de novo questions was administered to US adults with IH who reported current LXB use. Data were collected 08/26/24–12/12/24, and analyzed descriptively.

Results: Among 153 participants (71.9% female, 86.9% White, mean [SD] age 37.9 [12.1] years), mean (SD) time on LXB was 128.1 (43.0) weeks, with 71.2% taking LXB for ≥2 years; 20.3% took a once-nightly regimen, 79.1% took a twice-nightly regimen, and 53.6% were taking a concomitant alerting agent (AA). At survey completion, mean (SD) ESS score was 7.5 (4.6), with 75.2% of participants reporting normal daytime sleepiness (scores 0–10). Mean (SD) IHSS and VAS-SI scores were 23.3 (8.2) and 31.2 (25.8), respectively. On the PGI-C, 82.4% of participants reported their overall condition was “much improved” or “very much improved” since starting LXB; 94.1% reported that LXB was “effective” or “very effective” at managing their IH symptoms. After starting LXB, 56.2% either stopped taking or decreased the dosage/frequency of taking an AA. Most participants (86.9%) reported it was “very important” or “extremely important” that LXB dosing could be adjusted in consultation with their provider based on individual needs and/or experience. Additionally, 81.7% and 86.3% reported they were “satisfied” or “very satisfied” with how easy it was to take LXB and LXB for treatment of IH, respectively.

Conclusions: Real-world CHIME data suggest participants taking LXB experienced improvement in multiple IH symptoms, including EDS and sleep inertia, and reduced AA use after starting LXB. The ability to individualize dosing with LXB was highly important and patients reported high satisfaction with the ease of taking LXB.

Support: Jazz Pharmaceuticals.

LBA 1658

Real-World Surveys of Treatment Effectiveness and Satisfaction in Adults with Narcolepsy Taking Low-Sodium Oxybate

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Introduction: Low-sodium oxybate (LXB; Xywav®) is approved by the US FDA to treat excessive daytime sleepiness or cataplexy in patients ≥7 years of age with narcolepsy and to treat idiopathic hypersomnia in adults. The CHIME study evaluated real-world patient-reported outcomes, including treatment adherence, effectiveness, and satisfaction among adults with narcolepsy or idiopathic hypersomnia (reported separately) taking LXB.

Methods: A cross-sectional, web-based survey was administered to US adult participants taking LXB from 08/26/24–12/12/24. Descriptive analyses for participants with narcolepsy were conducted on standardized patient-reported outcome measures (including Epworth Sleepiness Scale [ESS], score range 0–24, and Patient Global Impression of Change [PGI-C]) and de novo questions.

Results: Among the 217 participants with narcolepsy (43.3% type 1, 72.8% female, 88.5% White, mean [SD] age 39.6 [12.6] years), mean (SD) time on LXB at survey completion was 147.1 (57.2) weeks, with 74.2% taking LXB for ≥2 years; 67.7% were taking a concomitant alerting agent (AA). Mean (SD) ESS score was 8.3 (4.9) with 68.5% reporting normal daytime sleepiness (scores 0–10). Mean (SD) number of cataplexy episodes over a 1-week period was 6.3 (9.7) before starting LXB and 1.7 (5.1) since starting LXB. On the PGI-C, 78.8% of participants reported their overall condition was “much improved” or “very much improved” since starting LXB. Most participants (97.7%) reported LXB was “effective” or “very effective” at managing their narcolepsy symptoms. After starting LXB, 41.0% either stopped taking or decreased the dosage/frequency of taking an AA. The majority of participants (88.0%) reported that it was “very important” or “extremely important” that their LXB doses could be adjusted in consultation with their provider based on their individual needs and/or experience. Additionally, 91.7% and 88.9% reported that they were “satisfied” or “very satisfied” with LXB for treating their narcolepsy, and how easy it was to take LXB, respectively.

Conclusions: Participants reported real-world effectiveness of LXB on multiple narcolepsy symptoms and many reported reducing or discontinuing an AA after starting LXB. The ability to individualize dosing with LXB was highly important, and participants reported high satisfaction with the ease of taking LXB.

Support: Jazz Pharmaceuticals.

LBA 1659

Demographic and Clinical Characteristics in Narcolepsy and Idiopathic Hypersomnia at Treatment Initiation

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Introduction: Given the potential side effects of therapies used to treat narcolepsy or idiopathic hypersomnia (IH), information on individual characteristics at treatment initiation is necessary. The objective of this analysis was to assess the demographic and clinical characteristics of people with narcolepsy or IH (PwN/PwIH), overall and at treatment initiation.

Methods: PwN and PwIH were identified from the Optum Market Clarity database (01/01/2018–12/31/2023), a linked electronic health records and claims database. Characteristics were assessed at diagnosis and at treatment initiation for each treatment group (treatment groups were not mutually exclusive): sodium oxybate (SXB; among PwN only), low-sodium oxybate (LXB), or alerting agents (AA). Demographics were evaluated at treatment initiation; comorbidities, defined by diagnosis claims (hypertension: diagnosis or antihypertensive medication use), were assessed in the 365-day period before diagnosis or treatment initiation. Data were analyzed descriptively; data analysis and interpretation were completed in 01/2025.

Results: Overall, 47,518 PwN and 23,392 PwIH were identified. PwN had a mean (SD) age of 44.5 (16.5) years and PwIH had a mean (SD) age of 45.0 (15.9) years; the majority were female (narcolepsy, 64.6%; IH, 65.6%). For PwN, among those initiating SXB (n=2467), 36% had hypertension, 25% had obesity, and 42% had sleep apnea; among those initiating LXB (n=1654), 43% had hypertension, 29% had obesity, and 42% had sleep apnea; and among those initiating an AA (n=32,629), 44% had hypertension, 35% had obesity, and 44% had sleep apnea. For PwIH, among those initiating LXB (n=350), 41% had hypertension, 30% had obesity, and 45% had sleep apnea; among those initiating an AA (n=11,136), 39% had hypertension, 35% had obesity, and 47% had sleep apnea. The prevalence of hypertension in women between the ages of 18–33 years with narcolepsy or IH who initiated LXB was 30% and 36%, respectively. Across treatment groups, >70% of individuals had ≥1 cardiovascular, cardiometabolic, or renal comorbidity.

Conclusion: These data demonstrate the high prevalence of cardiovascular, cardiometabolic, and renal comorbidities at diagnosis or treatment initiation in PwN and PwIH. Comorbidities should be considered when selecting treatments to mitigate excess sodium intake and associated cardiovascular and cardiometabolic risk.

Support: Jazz Pharmaceuticals.

LBA 1660

Qualitative Assessment of the Patient Experience of Idiopathic Hypersomnia: Implications for Evaluating Treatment Efficacy in Clinical Trials

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Introduction: The Epworth Sleepiness Scale (ESS) is the most-used patient-reported outcome measure of excessive daytime sleepiness (EDS). The Idiopathic Hypersomnia Severity Scale (IHSS) was developed to assess a range of IH symptoms and their functional consequences. This qualitative study examined how the content of the ESS and IHSS maps to the patient experience of living with IH to inform the selection of endpoints for clinical trials.

Methods: Interviews were conducted at the last study visit in a subset of patients (n=61) in a phase 3 clinical trial (HBS-101-CL-010). Trained qualitative researchers used a semi-structured interview guide with open-ended questions to elicit participants' experiences of IH. Transcripts were analyzed using applied thematic analysis; results were generated in January-February 2025.

Results: Baseline characteristics of interviewed participants (female, 80%; white, 90%; IH with long-sleep, 56.7%; taking medications for wakefulness, 70%; mean ESS score, 16.2; mean IHSS score, 34.4 [95% with score >22]) were similar to those of non-interviewed participants. Almost all interviewed participants spontaneously described experiencing EDS (98.3%) that disrupted their daily life (96.7%). Other prevalent symptoms were poor quality of wakefulness (81.6%), morning awakening problems (73.3%), sleep inertia (70.0%), and daytime tiredness (66.7%). Participants described the significant negative effect these symptoms had on their daily lives, including difficulty at work (71.2%) and interference with relationships and socialization (70.0%). Participant descriptions of their experiences with dozing off or falling asleep mapped to the activities/situations on the ESS. The content of most IHSS items (12 of 14) aligned with the experience of living with IH (sleep duration was not spontaneously discussed); participants rated all items as relevant or very relevant to their experience.

Conclusions: This qualitative study better characterized the patient experience of living with IH. Items on the ESS and IHSS were consistent with participants' descriptions of the experiences. Participants were able to accurately interpret ESS item content and response options, and they considered IHSS item content as relevant to their experience. These

findings support the utility of the ESS and IHSS as measures of treatment efficacy in clinical trials among patients with IH.

Support: Harmony Biosciences

LBA 1661

Vibrance-3: Study Design and Methods for a Phase 2, Randomized, Placebo-Controlled, Parallel-Group Study Evaluating the Safety and Efficacy of ALKS 2680 in Patients With Idiopathic Hypersomnia

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Introduction: ALKS 2680 is a highly potent, orally bioavailable, and selective orexin 2 receptor agonist being developed as a once-daily treatment for narcolepsy and idiopathic hypersomnia (IH). IH is a rare, chronic neurological disorder characterized by excessive daytime sleepiness and commonly associated with sleep inertia, long/unrefreshing naps, and prolonged nighttime sleep. In a phase 1b study in patients with IH, single doses of ALKS 2680 at 5, 12, and 25 mg demonstrated statistically significant, clinically meaningful improvements in mean sleep latency on the Maintenance of Wakefulness Test (MWT), improved self-reported alertness on the Karolinska Sleepiness Scale (KSS), and were generally well tolerated (no serious or severe treatment-emergent adverse events [TEAEs]). The Vibrance-3 study (NCT06843590) is a phase 2 study that aims to assess safety and efficacy of ALKS 2680 (vs placebo) through 8 weeks of treatment in patients with IH.

Methods: Vibrance-3 is a randomized, double-blind, parallel-group, dose-range-finding study. After 2 weeks of washout, approximately 96 patients with IH will be randomized 1:1:1:1 to receive placebo or ALKS 2680 once daily at doses of 10, 14, or 18 mg for 8 weeks. Eligible patients are aged 18-70y with IH diagnosis based on ICSD-3-TR criteria, BMI ≥18 and ≤40 kg/m^2, no significant comorbid sleep-related illness that may influence the sleep-wake cycle, no unstable medical conditions, and no shift work or activities that interfere with regular nighttime sleep. The primary endpoint is change in the Epworth Sleepiness Scale score from baseline to week 8. The key secondary endpoint is change in the Idiopathic Hypersomnia Severity Score from baseline to week 8. Safety will be evaluated by TEAEs, laboratory assessments, vital signs, electrocardiograms, and the Columbia-Suicide Severity Rating Scale. Exploratory assessments include mean sleep latency (measured across MWT sessions), Clinical Global Impression of Severity, and patient-reported outcomes, including the KSS.

Results: Vibrance-3 results are pending study completion.

Conclusions: Results from Vibrance-3 will inform further clinical development of ALKS 2680 in patients with IH. ALKS 2680 is also being evaluated in patients with NT1 and NT2 in

the ongoing phase 2 Vibrance-1 (NCT06358950) and Vibrance-2 (NCT06555783) studies, respectively.

Support: Alkermes, Inc.

LBA 1662
Pharyngeal Biostimulation for the Treatment of Obstructive Sleep Apnea

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Introduction: Stimuli controlling pharyngeal constrictor behavior during obstructive sleep apnea (OSA) are poorly understood but local mechanoreceptors may play a role. The hypothesis tested in this pilot study is that biostimulatory changes induced in the myofascial pharyngeal complex may improve upper airway tone.

Methods: Three volunteers (Case 1: Male; 62yrs; Case 2: Female; 65yrs; Case 3: Male, 46yrs) who participated in this study were scanned by a sonographer to gain echoarchitectural information of the end-tidal upper airway, using a hand-held ultrasound device, and given a home sleep apnea test (HSAT). Volunteers were subjected to initial biosignaling using a novel device (REMA Sleep, Inc.) for 15 mins. and immediately re-scanned. After daily use of the device for approx. 4 weeks (between Jan 10-Mar 12, 2025), volunteers were re-scanned and another HSAT was performed. From the ultrasound images, measurements were made in the lateral and axial planes to derive upper airway lengths, retroglossal cross-sectional areas (CSA) and upper airway volume measurements.

Results: Case 1: The upper airway length increased from 6.30cm to 6.90cm in the region measured (from the base of the tongue to the hyoid bone), while the CSA increased from 32.6cm^2 to 38.0cm^2, and the upper airway volume increased from 60.35cm^3 to 96.47cm^3. Case 2: The upper airway length increased from 6.10cm to 6.40cm, while the CSA increased from 29.4cm^2 to 32.6cm^2, and the volume increased from 74.33cm^3 to 80.44cm^3. Case 3: The upper airway length increased from 8.20cm to 8.40cm, while the CSA increased from 30.3cm^2 to 39.7cm^2, and the volume increased from 90.50cm^3 to 129.35cm^3 after approx. 4 weeks of daily biostimulation. For the HSATs, Case 1: the sleep quality index (SQI) improved from an initial minimum of 16 to a maximum of 25. For Case 2, the SQI was unchanged from an initial minimum of 29 to a maximum of 28, while in Case 3, the SQI improved from an initial minimum of 25 to a maximum of 34.

Conclusion: Pharyngeal biosignaling appears to induce beneficial changes in the upper airway in adults similar to those reported using surgically-implanted ansa cervicalis stimulation procedures for OSA.

Support: None

LBA 1663

Rapid Efficacy of a Non-Pharmacological Auditory Biofeedback Digital Therapeutic for Insomnia: A Randomized Crossover Proof-of-Concept Trial

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Introduction: Existing treatments for insomnia, including pharmacotherapy and Cognitive Behavioral Therapy for Insomnia (CBT-I), are often limited by concerns over medication safety and dependency, along with practical barriers to accessing behavioral therapies. Biofeedback has been explored as a non-pharmacological approach, but its effectiveness in insomnia treatment remains inconclusive. This study introduces and evaluates Self-regulating Auditory Biofeedback Therapy (SAB), a mobile-based digital therapeutic (pipeline code: BELL-001) that delivers real-time auditory feedback synchronized with users' bio-signals, designed to reduce hyperarousal and improve sleep initiation and maintenance.

Methods: A single-blinded, randomized crossover proof-of-concept trial was conducted with 10 participants experiencing insomnia symptoms (PSQI = 9.5). Participants were assigned to the SAB intervention and a no-treatment control condition in a randomized order. Sleep quality was assessed using polysomnography (PSG) and the Korean version of the Richards-Campbell Sleep Questionnaire (RCSQ). Primary and secondary endpoints included sleep latency (SL), sleep efficiency (SE), wake after sleep onset (WASO), sleep stage proportions, and subjective sleep quality.

Results: Compared to the control condition, the SAB intervention significantly reduced SL (mean difference = -11.2 min, $p = .004$) and WASO (mean difference = -28.1 min, $p = .018$), while increasing SE (mean difference = +8.5%, $p = .010$). PSG analysis revealed a significant increase in deep sleep (N3) proportion (mean difference = +9.23%, $p = .017$). RCSQ scores also improved significantly (mean difference = +21.0, $p < .001$).

Conclusion: This study provides preliminary clinical evidence supporting the rapid efficacy of a non-pharmacological, mobile-based auditory biofeedback digital therapeutic for insomnia. By integrating real-time biofeedback with a hardware-free, accessible design, SAB Therapy presents a promising alternative to conventional pharmacological and behavioral treatments. Future research may explore its integration with CBT-I or pharmacotherapy to enhance adherence and therapeutic outcomes, as well as its application in patient

populations where medication use is limited. Additionally, further investigation is needed to assess its long-term efficacy and generalizability across diverse patient populations.

Support: BELL Therapeutics Inc.

LBA 1664

Temperature-Regulated Mattress Cover as A Behavioral Intervention for Improved Sleep Hygiene

Authors and Institutions: Emma E. Tracy[1], Tatiana R. Ediger[1], Megan L. Holm[1], Emma R. Cary[1], Nicole E. Moyen[1], David D. He[1]

[1]Eight Sleep, Inc.

Introduction: Addressing sleep hygiene (SH) is often one of the first treatments for improving poor sleep. One aspect of improving SH is making your bedroom environment optimal for sleep; however, this can be challenging if the sleeping environment is uncomfortable or does not promote healthy habits. The Eight Sleep Pod is a temperature-regulated mattress cover, which may improve positive behavior changes by promoting a physiologically optimal sleeping environment. Therefore, this study investigated whether the use of a temperature-regulated mattress cover could impact SH and daytime sleepiness.

Methods: 256 adults (198 males; 42±11y) completed the 13-item Sleep Hygiene Index (SHI) and the 8-item Epworth Sleepiness Scale (ESS) at three timepoints: before using the Pod (i.e. Pod-OFF; no temperature regulation), after using the Pod for one week and one month (i.e., Pod-ON; 6/1/2024-3/1/2025). Pearson *r* correlations assessed SHI and ESS scores as a change score from Pod-OFF to Pod-ON vs. Pod-OFF, and ANOVAs were used to analyze temporal differences in survey responses.

Results: Global SHI scores improved by 4% after one-week and 16% after one-month Pod-ON; global ESS improved by 7% after one-month of Pod-ON (both $P<0.05$). Those with worse SH and sleepiness during Pod-OFF experienced the largest improvements with Pod-ON (both $r=-0.34$; $P<0.05$). After one-week of Pod-ON, subjects reported improved bed comfort (11%), reduced stress, negative emotions (-12%) and thinking, planning, or worrying at bedtime (-9%; all $P<0.05$). After one-month of Pod-ON, all improvements persisted (20%, -17%, -17%, respectively, all $P<0.05$). Additionally, subjects rated their sleeping environment 23% better (e.g., lighting, temperature, sound), reduced excess time in bed, (-11%) and decreased work at bedtime (-12%, $P=0.01$).

Conclusion: A continuously temperature-regulated mattress cover is an effective behavioral intervention to improve SH and reduce daytime sleepiness, especially for individuals with poor SH and excessive sleepiness. After using the Pod, subjects reported reduced work at bedtime, lower emotional distress, and improved bed comfort and bedroom environment. Altogether, sleeping on a temperature-regulated mattress cover can support healthier sleep behaviors within just one week.

LBA 1665

Using a Continuously Temperature-Regulated Mattress Cover Reduces Nighttime Hot Flash Frequency and Improves Physical Comfort Among Menopausal Women

Authors and Institutions: Megan L. Holm[1], Tatiana R. Ediger[1], Emma R. Cary[1], David D. He[1], Nicole E. Moyen[1]

[1]Eight Sleep, Inc.

Introduction: By 2030, 1.2 billion women (14% of the global population) will be menopausal. 80% of menopausal women have hot flashes, negatively impacting sleep quality. Women waking from nighttime hot flashes often use inconvenient methods to cool themselves, such as removing covers or applying wet towels. The Eight Sleep Pod, a continuously temperature-regulated mattress cover, may reduce hot flash frequency by keeping women cooler throughout the night. The purpose of this study was to explore how a continuously temperature-regulated mattress cover impacts nighttime hot flashes and physical comfort.

Methods: Forty-one menopausal women (mean±SD: 50.6±6.73 yo) slept on the Pod for 10-14 nights (1/23/25-2/25/25), with temperatures OFF for the first 5-7 nights and temperatures ON for the last 5-7 nights. Each night, women recorded when hot flashes occurred. After Pod OFF and ON study phases, women completed the Menopausal Rating Scale (MRS), an assessment of menopausal symptom severity and physical comfort, where a lower score is better. Sensors on the Pod collected objective sleep data, which were analyzed alongside the subjective survey data.

Results: Sleeping with Pod ON reduced nighttime hot flashes by 54% (mean±SD change: -1.13±0.90 hot flashes; $P<0.001$), whereby 65% of testers experienced ≥50% fewer hot flashes per night. These reductions in hot flash frequency occurred regardless of women's initial (Pod OFF) hot flash frequency ($P=0.22$). From Pod OFF to ON, average MRS score decreased from 15.0 to 13.0 (mean±SD % change: -5.9±40.0%; $P=0.02$), and average MRS somatosensory subscore (i.e. physical discomfort) decreased from 6.11 to 4.92 (mean±SD % change: -14.1±33.5%; $P=0.008$). Despite reduced hot flashes with Pod ON vs. OFF, there were no statistically significant differences in total sleep time (7.55 vs. 7.47 h, respectively) or wake after sleep onset (42.0 vs. 40.3 min, respectively; both $P>0.05$).

Conclusion: A temperature-regulated mattress cover, like the Pod, can be an effective solution in helping reduce menopausal nighttime hot flash frequency and therefore improve physical comfort during sleep.

LBA 1666

Signal Quality and Recording Characteristics of Patient-Applied Home Polysomnography: A Real-World Analysis Across US and European Settings

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Background: While home polysomnography shows promise for expanding access to sleep diagnostics, real-world data on technical performance and usage patterns is limited. This study analyzed outcomes from patient-applied home PSG (hPSG) studies conducted across US and European healthcare settings.

Methods: We analyzed 548 sleep studies conducted between January 2024-February 2025 using a patient-applied, patch-based hPSG system. The system included sensors for monitoring electroencephalography (EEG), electrooculography (EOG), electromyography (EMG), electrocardiography (ECG), respiratory effort, nasal airflow, oxygen saturation, body position, and movement. Studies were conducted exclusively at patients' homes without technician intervention and were manually scored according to AASM criteria. Data collection included technical performance metrics such as scorer-reported signal quality assessments, sleep architecture parameters, and demographic information. Signal quality was rated on a percentage scale with >80% considered acceptable quality. Statistical analyses compared performance metrics across geographic regions (EU vs. US) and days of the week using appropriate tests with significance levels set at $p<0.05$.

Results: Essential diagnostic signals, defined as at least 1 EEG, 1 EMG, 1 EOG, SpO2, nasal pressure, 1 respiratory signal and body position, achieved >80% quality in 91.4% of studies, with consistent performance between regions (EU: 91.5%, US: 91.2%). Mean recording duration was 527.1 ± 163.6 minutes, with US recordings significantly longer than EU (+56 minutes, $p<.001$). Sleep patterns showed consistent behavior, with 84.1% of lights-off times occurring between 10 PM -1 AM, and 70.3% of lights-on times between 6-9 AM, reflecting typical sleep schedules. This suggests patients maintain their sleep patterns during home testing. Average time from study request to report completion was 23.3 ± 13.1 days, providing insight into typical clinical workflows. Recording quality remained consistent across weekdays, with a non-significant trend toward longer recordings on Saturdays ($p=.167$), suggesting flexibility in scheduling that could increase recording length and diagnostic information.

Conclusions: This first real-world analysis demonstrates that patient-applied hPSG achieves consistent technical success rates across different settings. The observed consistency in signal quality and preservation of natural sleep timing patterns supports the reliability of this diagnostic approach for sleep diagnostics in patients' home environments.

Regional variations indicate differences in implementation that warrant further investigation.

LBA 1667

Nightly Suppression of Epileptiform Activity via Non-Invasive Temporal Interference Neuromodulation: Role of Improved Sleep as a Force Multiplier in Seizure Reduction

Authors: Adam Williamson, Florian Missey, Melany Boly, Giulio Tononi, Daniel Drane, Nigel Pedersen

Introduction: Epilepsy is a neurological disorder that disrupts sleep patterns, leading to fragmented sleep and worsened cognitive function, while also increasing seizure frequency.

Methods: The SENSE research project explores the therapeutic potential of Temporal Interference (TI) stimulation, a novel non-invasive deep brain stimulation technique, to enhance sleep quality and reduce epileptic activity in patients with epilepsy, without the need for surgical implants.

Results: The first piloting phase of the project involved patients with surgically implanted electrodes (sEEG electrodes) to assess the effects of TI stimulation on deep brain electrophysiological markers of sleep, such as slow oscillations, sleep spindles, and sharp wave ripples during NREM sleep. This phase took place from December 2024 to March 2025. Using this first phase of the project we were able to establish the optimal TI stimulation parameters that improve sleep architecture and suppress epileptic activity. The therapeutic phase, expands the piloting experiments including patients with and without brain implants, applying the refined TI stimulation protocols and assess sleep quality, sleep pattern via polysomnography but also check epileptic biomarkers overnight. Preliminary results have shown promising outcomes, with TI stimulation significantly suppressing epileptiform discharges and promoting deeper sleep states, particularly slow-wave sleep (NREM3). Data also suggests improvement in sleep spindles and sharp wave ripple activity, which are important markers for sleep quality and seizure control.

Conclusion: These findings support the potential of TI as a non-invasive treatment to address two major challenges in epilepsy: disrupted sleep and frequent epileptiform discharges during sleep. This project could lead to a new treatment option that improves sleep quality, reduces seizure frequency and severity, and enhances cognitive function in epilepsy patients. Additionally, the non-invasive nature of TI stimulation may offer a therapeutic option for other neurological disorders involving sleep disturbances. This research has the potential to significantly advance our understanding of the neurophysiological interactions between sleep processes and epilepsy, ultimately providing a safer, more accessible alternative to invasive treatments for epilepsy and potentially other conditions.

LBA 1668

Sodium-Associated Comorbidity Risk Profiles in Individuals With Narcolepsy and Idiopathic Hypersomnia in the US

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Introduction: Individuals with narcolepsy and idiopathic hypersomnia (IH) have an elevated prevalence of cardiovascular, cardiometabolic, and renal comorbidities, which may be exacerbated by excess sodium intake. This study characterized the prevalence and comorbidity risk factor profiles for sodium-associated negative clinical outcomes (NCOs) among individuals with either condition.

Methods: Individuals diagnosed with narcolepsy or IH were identified from Komodo Research Data (01/01/2016–01/31/2024); data were analyzed in December 2024. Demographic characteristics were assessed at index (first-observed narcolepsy or IH diagnosis); risk factors for sodium-associated NCOs were assessed in the 12-month continuously enrolled pre-index period. Sodium-associated risk factors, selected through literature review and clinical expert discussions, included cardiovascular, cardiometabolic, and renal comorbidities; liver cirrhosis; and sleep apnea. Risk factor presence was defined by ≥1 medical claim with diagnosis code(s) for the condition or ≥1 prescription fill for a medication for hypertension, diabetes/obesity, or hyperlipidemia. An additional analysis required ≥2 diagnosis codes on distinct dates to define risk factor presence.

Results: Overall, 29,317 individuals with narcolepsy (mean age 41.4 years, 62.1% female, 77.8% White) and 11,951 with IH (mean age 41.7 years, 66.4% female, 81.1% White) were included. Most individuals had ≥1 risk factor (narcolepsy: 69.2%; IH: 74.4%); nearly half had ≥2 risk factors (narcolepsy: 45.1%; IH: 48.4%). When the requirement for ≥2 diagnosis codes was applied, over half of individuals had ≥1 risk factor (narcolepsy: 58.8%; IH: 63.1%). Cardiovascular comorbidities were observed in 40.8% and 40.2% of individuals with narcolepsy and IH, respectively—most commonly hypertension (narcolepsy: 39.3%; IH: 38.8%) and atherosclerosis (narcolepsy: 6.6%; IH: 5.8%). Cardiometabolic comorbidities (narcolepsy: 49.9%; IH: 51.8%)—most commonly diabetes/obesity (narcolepsy: 38.3%; IH: 39.6%), hyperlipidemia (narcolepsy: 30.1%; IH: 30.7%), and edema (narcolepsy: 7.7%; IH: 6.7%)—were frequent, as was sleep apnea (narcolepsy: 35.7%; IH: 46.4%). Renal comorbidities (narcolepsy: 5.3%; IH: 4.2%) and liver cirrhosis (narcolepsy: 0.4%; IH: 0.3%) were also observed.

Conclusions: A high cardiovascular and cardiometabolic burden was observed in individuals with narcolepsy or IH. Most individuals in this sample had ≥1 risk factor, highlighting the sodium-relevant comorbidity burden. These findings reinforce the need to mitigate the underlying risk for sodium-associated NCOs.

Support: Jazz Pharmaceuticals.

LBA 1669

Improvement of Sleep Quality and Insomnia Symptoms with Haptic Technology

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Introduction: Sleep issues are widely prevalent, greatly impacts quality of life, and imparts a significant personal and societal burden. Approximately 35 to 40% of the U.S. adult population report having problems with falling asleep or experience daytime sleepiness. These effects can have a significant impact on both morbidity and mortality, making this a serious health concern.

Many treatments for insomnia and other sleep-related disorders typically involve sleep-inducing medication, cognitive therapy, or a combination of both. Pharmacological approaches have been associated with undesirable and serious side effects, some life-threatening, and thus, limiting the effectiveness and desirability of the treatment. Other approaches including herbal medicine, homeopathy, and dietary supplementation also report adverse side effects and have limited scientific evidence. There is a need to identify alternative, non-invasive, and non-pharmacological approaches for better sleep management. Recent research has shown that haptics has improved sleep quality, duration, and quality of life.

RESTORE is a minimal risk, randomized-controlled trial that evaluated subjects with sleep related issues after use of a drug-free, haptic vibrotactile trigger technology (VTT) Patch (REM Patch; The Super Patch Company Inc.; Toronto Canada). Data reported here was evaluated between January 2025 and March 2025.

Methods: Several dozen males and females, ages 18-85, were enrolled in the study and provided with an Active patch embedded with VTT or a Sham patch without VTT. Sleep-related information (e.g., sleep duration, time to fall asleep, sleep awakenings, REM sleep duration, etc.) was collected over 21 days via a WHOOP™ wearable device and through validated scales including the PSQI and ISI.

Results: The Treatment group showed statistically significant decreases in time to fall asleep, an increase in number of hours of sleep, level of sleep, and reduction in global PSQI Score and ISI scores with minimal side effects.

Conclusion: Study results indicate that this haptic vibrotactile trigger technology (VTT) topical patch improves sleep quality, sleep duration, and quality-of-life components. Results suggest that the sleep patch has great potential to be added to current approaches and may support use as a first-line non-pharmacological treatment option.

Support: Funding for this trial was provided by The Super Patch Company, Toronto, Canada.

LBA 1670

Accelerometry Assessment of Factors Related to how TAK-861 Affects Disrupted Sleep in People with Narcolepsy Type 1

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Introduction: Disrupted nighttime sleep (DNS) is a key symptom of narcolepsy type 1 (NT1) reflecting impairment and instability of nighttime sleep. Wrist-worn accelerometers offer a convenient method for measuring sleep longitudinally. We applied an accelerometry-based sleep algorithm to characterize nighttime sleep disturbances in treated and untreated people with NT1, comparing at-home and in-clinic sleep and correlating actigraphy-based sleep estimates to self-report.

Methods: Our algorithm was applied in a phase 0 non-interventional study of 16 participants with NT1 and 16 healthy sex- and age-matched controls (NCT04445129), and a phase 2 interventional study of TAK-861 in 112 participants with NT1 (NCT05687903) with nocturnal polysomnography on study nights -2, 27, and 55. T-tests and k-means clustering were used to quantify differences in at-home versus in-clinic sleep and characterize sleep disruption. Mixed-effects regression was used to estimate sleep differences between NT1 and controls and compare subjective and objective measures of DNS. Analyses were completed on February 25, 2025.

Results: In the non-interventional trial, participants with NT1 experienced 10.6% less sleep efficiency than controls ($p<0.001$, $n = 32$), resulting from 57.8 fewer minutes of total sleep time (TST, $p<0.001$) and 47.5 more minutes of wake after sleep onset (WASO, $p<0.001$). In the interventional trial, participants sleeping at home went to bed 70.1 minutes later ($p<0.001$, $n = 112$), spent 29.8 fewer minutes in bed ($p<0.001$), and had 7.6% lower sleep efficiency ($p<0.001$) compared to their in-clinic nights where sleep times were constrained by study protocol. Self-reported transient insomnia was related to TAK-861 exposure, with 33 (81%) of 41 cases resolving within 6 days. Daily at-home accelerometry confirmed transient insomnia, with delayed bedtime and reduced TST ($p<0.5$) in week 1, followed by recovery. Accelerometry-based measures correlated well with subjective measures from sleep diaries, such as self-reported good sleep quality being associated with higher sleep efficiency and TST ($p<0.001$), and lower WASO ($p<0.05$).

Conclusion: Accelerometry allows monitoring of at-home sleep for people with NT1, capturing increased sleep disruption versus controls, and showing good correlation to self-report. At-home and in-clinic sleep significantly differed, highlighting the value of at-home monitoring, which allowed us to capture the resolution of treatment-related insomnia.

Support: Funded by Takeda.

LBA 1671

Breathing Disturbances in a Real-World Cohort: Associations with Age, Sex, Weight, and Weight Change

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Introduction: Sleep apnea is a prevalent condition that remains largely undiagnosed. We recently obtained clearance from the Food and Drug Administration for a Software as a Medical Device feature (K240929) intended to identify patterns of breathing disturbances suggestive of moderate-to-severe sleep apnea. The objective of this study is to characterize the Breathing Disturbances metric (event rate of disturbances per hour) in a naturalistic real-world cohort.

Methods: We included participants who provided informed consent and opted in to share health and sleep data, including watch sensor data, as part of the Apple Heart and Movement Study. The algorithm for computing breathing disturbances was applied offline by processing accelerometer recordings from over 20,000 participants, with at least 60 nights of sleep data each, totaling over 3 million nights, with analysis in December 2024 to February 2025. The Breathing Disturbances metric output was compared with self-reported demographic values and body mass index (BMI), as well as change in weight over time.

Results: The average Breathing Disturbances values per participant followed expected associations with age, sex assigned at birth, and BMI. The mean and standard deviation (SD) of Breathing Disturbances values were higher in males (5.2 +/- 7.4) versus females (2.9+/-4.5), higher in older (5.3 +/- 7.1) versus younger (2.9 +/- 5.1) using the median age of 40 years, and higher in those with higher BMI (5.3 +/- 7.8) versus lower BMI (3.0 +/- 4.1) using the median value of 27.3 kg/m2; all comparisons with $p<0.00001$. Breathing Disturbances values were positively associated with self-reported heart disease and smoking, after controlling for age, sex, and BMI (regression coefficients of 0.28 and 0.4, $p<0.00001$). For a subset of participants with weight change of at least 5 kg (up or down) over at least a 3 month time window, we observed concordant directional change (up or down) of the Breathing Disturbances values at the group level.

Conclusion: The Breathing Disturbance metric derived from a consumer wearable device shows associations with known demographic and medical risk factors for sleep apnea in a large longitudinal cohort.

Support: n/a

LBA 1672

Characterizing Arrhythmia Onset During Sleep and Activity: Insights from Long-Term Continuous Monitoring in a Large National Cohort

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Introduction: Circadian patterns of arrhythmias have been described only in small, non-generalizable datasets. Integrating accelerometer data with ambulatory ECG long-term continuous monitoring (LTCM) may enable insights into the relationship between arrhythmia onset and physiological states such as sleep, wake, activity or movement, and inactivity.

Methods: We conducted a retrospective analysis of patients monitored for clinical indications between August 2023 and July 2024 using an FDA-cleared LTCM device which detects 14 rhythm classes (Zio® Monitor; iRhythm Technologies, San Francisco, CA). Patients were randomly sampled and stratified by month. An AI algorithm incorporating accelerometer data was previously developed and validated to classify periods of sleep, wake, activity (≥2 mph walking), and inactivity using the monitor's embedded accelerometer. Arrhythmia episodes were identified using a deep learning algorithm and confirmed by a cardiographic technician. The AI was applied in February 2025; arrhythmia onsets were identified and time-aligned with sleep and activity classifications. Odds ratios (OR) for arrhythmia onset occurring during sleep and activity periods were calculated by rhythm type.

Results: The analysis included 23,962 patients (mean age 60.9 ± 18.0 years; 57.7% female). Palpitations were the most common monitoring indication. Median LTCM wear time was 13.7 days (IQR 7.2-14.0 days). Median time in sleep was 30.4% (IQR 26.5%-39.4%) and 69.6% (IQR 65.1%-73.5%) in wake. During wake, 2.1% (IQR 0.5%-4.8%) of time was spent in activity, and 97.9% (IQR 95.2%-99.5%) in inactivity. Arrhythmia onset was most strongly associated with sleep for pause (OR=2.70; 95% CI 2.65-2.76), second-degree AVB (Wenckebach; OR=2.20; 95% CI 2.19-2.21) and idioventricular rhythm (OR=1.95; 95% CI 1.91-1.98). Complete heart block (OR=4.55; 95% CI 4.36-4.75), and second degree AVB (Mobitz type 2; OR = 2.26; 95% CI 2.15-2.37) had the highest association with activity. AF onset was more likely to occur in wake than sleep (OR= 0.87; 95% CI 0.86-0.89) and more likely during activity than inactivity (OR=1.52; 95% CI 1.44-1.61).

Conclusions: This is the largest study of the relationship of arrhythmia onset to sleep and activity. Results demonstrate that integrating sleep and activity labeling with uninterrupted LTCM arrhythmia findings provides clinically meaningful data to guide risk stratification and further patient management.

LBA 1673

Evidence for a Deep Sleep Homeostatic Response in Ambulatory Settings

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Introduction: Sleep homeostasis (SH) regulates human sleep. Traditionally, EEG slow-wave activity during deep sleep serves as a proxy for SH. We examine deep sleep duration within the first two hours of sleep onset as a possible indicator of SH pressure, using smartwatch data from daily life monitoring.

Methods: Sleep data were collected from 28 participants (ages 18-54, 57% female, 25% male, 18% unreported) monitored for 14 days of ambulatory use. We obtained nightly total sleep time (TST) from Galaxy Watch 6 (GW), ActLumus measurements, daily morning surveys, and combined the observed GW and Survey data as a fourth modality. The mean TST per night was calculated from the four aforementioned variables. We also obtained nightly deep sleep data from GW. Short nights were those with at least 30 minutes less sleep than participants' median TST. The mean difference in deep sleep during the first two hours of sleep following a short night was calculated relative to (i) deep sleep in the first two hours of the short night and (ii) participant's median deep sleep duration in the first two hours of all sleep sessions. Results are based on 50 short nights among participants with valid deep sleep data (mean TST across participant's night, alongside short night and following-night deep sleep durations, both measured for the first two hours of sleep onset).

Results: The mean increase in deep sleep during the first two hours of the night following a short night, compared to the previous night, was 9.6 minutes ($p < 0.01$) and compared to the participants' median deep sleep time during the first two hours was 5.6 minutes ($p < 0.05$). Both were dose-dependent.

Conclusion: The night after a short-sleep-night showed a statistically significant increase in deep sleep in the first two hours of sleep onset. This suggests that a smartwatch might help measure sleep debt and provide a convenient way to collect data at home about daily sleep behaviors and homeostatic regulation. Data was provided for analysis in February 2025.

Support: Study supported by Samsung Research America.

LBA 1674

Narcolepsy Treatment Trends and Change in Alerting Agent Use After Low-Sodium Oxybate Initiation

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Introduction: Narcolepsy, a central disorder of hypersomnolence, comprises 2 subtypes (types 1 and 2) and is primarily characterized by excessive daytime sleepiness (EDS), disrupted nighttime sleep, and cataplexy (type 1). Sodium oxybate (SXB; Xyrem®) was FDA-approved to treat cataplexy (in 2002) and EDS (in 2005) among adults with narcolepsy (and among individuals ≥7 years in 2018); low-sodium oxybate (LXB; Xywav®) was FDA-approved in 07/2020. Additional treatments include alerting agents (AAs; defined as stimulants and/or wake-promoting agents). Our objective was to assess narcolepsy treatment patterns, as well as changes in AA claims following LXB initiation.

Methods: This retrospective cohort study used the Optum® Market Clarity dataset (2007–2023) to examine individuals with narcolepsy, aged ≥7 years, with ≥180 days medical/pharmacy enrollment prior to incident narcolepsy diagnosis (index date). Real-world treatment patterns were assessed following index until the end of the study period (2007–2023) and in the post-LXB approval period (2020–2023). Among individuals with AA claims prior to LXB initiation, reductions of dose or number of AAs, discontinuations, switches, and no change in AA claims in the 180 days following LXB initiation were evaluated. Data analysis/interpretation was completed 01/2025.

Results: This study included 43,252 individuals diagnosed with narcolepsy (mean age: 42.8 years [standard deviation: 17.2]; 62.9% female), among them 10,220 in the post-LXB approval period. In the overall and post-LXB approval periods, the most frequent first-line treatments were AAs (overall: 52.7%; 76.1% among those who received any treatment; post-LXB: 49.0%; 75.4% among those treated). Among the 1032 individuals with narcolepsy who initiated LXB, 788 (76.4%) had AA claims prior to initiation; among those, 42.9% experienced an AA reduction or discontinuation, 5.3% switched to another AA, and 32.6% had no AA claim changes following LXB initiation. Stratified by prior SXB use, 38.2% (n=193/505) with and 51.2% (n=145/283) without prior SXB use experienced a reduction or discontinuation in AAs following LXB initiation.

Conclusions: Approximately 50% of individuals with narcolepsy were first treated with AAs following diagnosis. Nearly 43% of individuals with narcolepsy reduced or discontinued AAs following initiation of LXB.

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Idiopathic Hypersomnia Treatment Trends and Change in Alerting Agent Use After Low-Sodium Oxybate Initiation

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Introduction: Idiopathic hypersomnia (IH) is a neurologic sleep disorder characterized by severe excessive daytime sleepiness; long, nonrestorative sleep; and severe sleep inertia. While low-sodium oxybate (LXB; Xywav®) is the only FDA-approved treatment for IH, individuals with IH are often treated symptomatically with medications prescribed off-label. Little is known about real-world IH treatment patterns and changes in alerting agent (AA; defined as stimulant and/or wake-promoting agent) claims following LXB initiation.

Methods: This retrospective cohort study used the Optum® Market Clarity dataset (2007–2023) to examine individuals diagnosed with IH, aged ≥18 years, with ≥180 days medical/pharmacy enrollment prior to incident IH diagnosis (index date). Treatment patterns were assessed following index until the end of the study period (2007–2023) and in the post-LXB approval period (2021–2023). Among individuals with AA claims prior to LXB initiation, reductions in dose or number of AAs, discontinuations, switches to another AA, and no change in AA claims in the 180 days following LXB initiation were evaluated. Data analysis/interpretation was completed in 01/2025.

Results: This study included 24,528 individuals diagnosed with IH (mean age, 45.8 years [standard deviation, 15.7], 61.7% female, 73.6% White). Throughout follow-up, 45.9% of individuals had ≥1 claim for a predefined treatment of interest over a median follow-up of 2.3 years; the most frequent first-line treatments were AAs (31.2% overall; 67.9% among those treated). During the post-LXB approval period (n=2971), 49.7% were treated; the most common first-line treatments were AAs (36.2% overall; 72.9% among those treated), and among those treated in the second line, 19.8% were treated with AAs and 7.9% with AAs and LXB. Among the 120 individuals who initiated LXB, 96 (80.0%) had AA claims prior to LXB initiation; among those 96 individuals, 53.1% experienced AA discontinuation or reduction, 8.3% switched, and 21.9% had no AA claim changes following LXB initiation.

Conclusions: IH treatment patterns showed numerous combinations of treatments and treatment trajectories following IH diagnosis, highlighting the difficulty and complexity in treating this condition. AA use was common prior to LXB initiation, and approximately 50% of these individuals discontinued or reduced AAs following LXB initiation.

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Preliminary Results of a Next-Generation Hypoglossal Nerve Stimulation Therapy for the Treatment of Obstructive Sleep Apnea

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Introduction: Hypoglossal nerve stimulation (HGNS) is a proven therapy for moderate to severe OSA patients who struggle with CPAP. The next-generation Inspire HGNS System (Inspire V) is designed to simplify the procedure by including sensing technology within the IPG and eliminating the sense lead. It is also designed to provide increased patient comfort and more efficient patient management with new features including therapy ramp duration and smaller amplitude step sizes. This study includes implant and follow-up of the first worldwide implants of this new-generation HGNS technology.

Methods: First implants and activations of this new technology occurred in a prospective, multicenter study of 44 patients in Singapore, who are being followed to 6 months post-therapy activation. Baseline and medical history were collected for all participants. Implant information including duration of implant (from first incision to last closure) was reported and compared to implant times from the previous generation (which included implantation of a sense lead). Therapy use after activation of the therapy was reported at 3 months post-implant. Adverse events were also collected.

Results: A total of 44 participants (88.6% male; mean age: 55.68±10.24 yrs; baseline AHI: 36.97±15.23; baseline BMI: 26.91±2.75) were implanted with the Inspire V system between September 2024 and February 2025. No unexpected adverse effects have been reported at or after implant of the systems. Implant times decreased by 20.4% compared to implant of the previous HGNS system. At the 3 months visit, ramp duration (5/10/15 min) was reportedly utilized in 25% of patients for additional support for comfort and/or insomnia. The smaller amplitude step size was reportedly utilized in 12% of patients, specifically to support comfort while the patient is acclimating to therapy. Mean therapy use at 3 months post-activation (n=30) is 6.0±1.67 h/nt.

Conclusion: The next-generation HGNS technology provides more efficient implantation as well as features that can be utilized to increase patient comfort and utilization.

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