2025: YEAR IN REVIEW

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1

TOPICS FOR 2025

- DEMENTIA
- AUTISM
- CLIMATE CHANGE
- ANIMAL RESEARCH
- WAKING UP

2

PART 1- DEMENTIA

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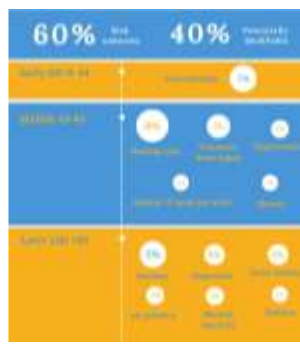

Lancet Commission Report 2020

Three new risk factors added:
- Excessive alcohol consumption
- Head injury
- Air pollution

But still no mention of sleep!

4

Lancet Commission Report 2024

Two new risk factors added:
- Vision loss
- High cholesterol

Potential risk factors:
being considered with insufficient evidence
- Duration, shift work, sleep apnea
- Diet
- Infection
- Psychosis, PTSD
- Menopause & HRT
- Multimorbidity & frailty

Livingston G et al., The Lancet, 10425:572-628, 2024.

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PART 1A- SLEEP AND RHYTHMS ASSOCIATED WITH INCREASED RISK FOR DEMENTIA

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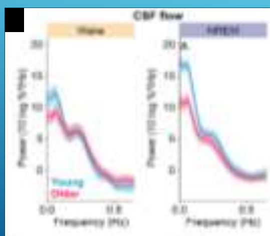
CSF FLOW REDUCED IN AGING IN COGNITIVELY NORMAL SUBJECTS



CSF flow measured with simultaneous EEG-fMRI-CSF data in young (18-39 y/o, n=25) and older (60-84 y/o, n=39) adults

CSF flow in sleep reduced in older adults and linked to both decreased frontal delta EEG and gray matter atrophy

Bailes SM et al., bioRxiv [Preprint]. 2025 Feb 24:2025.02.22.639649.

7

META-ANALYSIS OF SLEEP DISORDERS AND DEMENTIA, AD, AND COGNITIVE DECLINE

Meta-analysis of 39 cohort studies that reported risk estimates for dementia, AD, or cognitive decline associated with obstructive sleep apnea, insomnia, or other sleep disorders

Other sleep disorders included restless leg syndrome, circadian rhythm sleep disorders, excessive daytime sleepiness, and other non-specific sleep disturbances

Results demonstrate associations between a range of sleep disorders and an elevated risk of dementia

Ungvari Z & Fekete M et al., GeroScience doi: 10.1007/s11357-025-01637-2, 2025.

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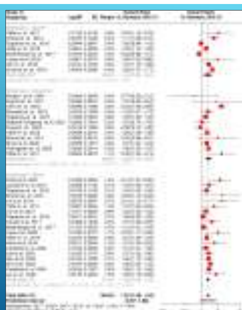
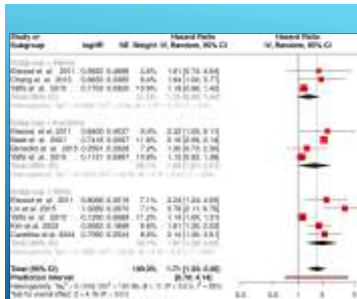


HAZARD RATIOS FOR ALL-CAUSE DEMENTIA RISK

- **Pooled HRs:**
  - **1.33 (95% CI 1.09-1.61) for apnea**
  - **1.36 (95% CI 1.19-1.55) for insomnia**
  - **1.33 (95% CI 1.24-1.43) for other sleep disorders**

Ungvari Z & Fekete M et al., GeroScience doi: 10.1007/s11357-025-01637-2, 2025.

9

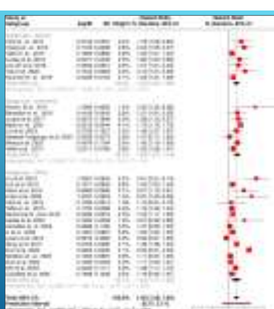


HAZARD RATIOS FOR VASCULAR DEMENTIA

- **Pooled HRs:**
  - **1.35 (95% CI 0.99-1.84) for apnea (NS)**
  - **1.59 (95% CI 1.01-2.51) for insomnia**
  - **1.97 (95% CI 1.28-3.02) for other sleep disorders**

Ungvari Z & Fekete M et al., GeroScience doi: 10.1007/s11357-025-01637-2, 2025.

10

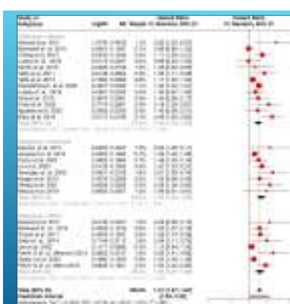


HAZARD RATIOS FOR AD

- **Pooled HRs:**
  - **1.45 (95% CI 1.24-1.69) for apnea**
  - **1.49 (95% CI 1.27-1.74) for insomnia**
  - **1.42 (95% CI 1.11-1.83) for other sleep disorders**

Ungvari Z & Fekete M et al., GeroScience doi: 10.1007/s11357-025-01637-2, 2025.

11



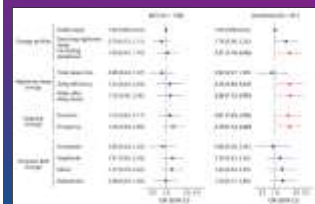
HAZARD RATIOS FOR COGNITIVE DECLINE

- **Pooled HRs:**
  - **1.44 (95% CI 1.24-1.68) for apnea**
  - **1.63 (95% CI 1.36-1.95) for insomnia**
  - **1.55 (95% CI 1.27-1.90) for other sleep disorders**

Ungvari Z & Fekete M et al., GeroScience doi: 10.1007/s11357-025-01637-2, 2025.

12

INCREASING SLEEPINESS IN OLDEST OLD WOMEN ASSOCIATED WITH DEMENTIA RISK



- 733 women (82.5+2.9 y/o)
- Changes in actigraphic sleep assessed after 5 yrs (3.5-6.3 yrs)
- Women with increasing sleepiness had double the risk of dementia (OR 2.21, 95% CI 1.14-4.26) compared to those with stable sleep.

Milton S et al., Neurology 104(8):e213403, 2025.

13

SLEEP DISTURBANCE ASSOCIATION WITH INCIDENT DEMENTIA STRONGER WITH LONG LAG TIMES

- Data from Longitudinal Aging Study Amsterdam that assessed association of sleep disturbance with incident dementia with lag times of 2.2-23.8 yrs (n=2,218; 55-85 y/o at entry;11% developed dementia)
- Self-reported sleeping $\leq$6 h, interrupted sleep, and early awakening associated with incident dementia
- Associations stronger with lag times $\geq$15 yrs
- Sleeping $\geq$9 h associated with increased incident dementia with lag time of 3 yrs but not when lag time >5.5 yrs.

Alders P et al., J Prev Alzheimers Dis 12(2):100024, 2025.

14

OSAS AND RISK OF DEMENTIA

- Data from 2.3 million adults in UK Clinical Practice Datalink
- 193,600 subjects with OSAS matched to 536,701 individuals without OSAS; median follow-up of 4 yrs
- Presence of OSAS associated with higher risk of all-cause dementia (aHR 1.12, 95% CI 1.07-1.17) and vascular dementia (aHR 1.29, 95% CI 1.19-1.41) but unchanged risk for Alzheimer's disease
- Those treated with CPAP had similar risk of all-cause dementia as matched counterparts

Wang J et al., Thorax 80:167-174, 2025.

15

INCREASED DEMENTIA RISK WITH EARLIER OSA ONSET

- UK Biobank study including 445,023 participants without dementia or sleep disorders other than OSA at baseline
- 12.6 year median follow-up
- Subjects with OSA had higher risks for dementia than matched subjects without OSA with hazard ratios as follows:
  - All-cause dementia 4.243 (95% CI: 3.678–4.897)
  - AD 5.668 (95% CI: 4.380–7.336)
  - Vascular dementia 6.064 (95% CI: 4.008–9.175)
- OSA present at age < 52 associated with higher risks for all 3 types of dementia

Gang C & Chen C, J Psychiatr Res 184:170-175, 2025.

16

SLEEP DISTURBANCE AS A RISK FACTOR FOR NEURODEGENERATION

- Data from 3 biobanks
  - Secure anonymized Information Linkage (SAIL)
  - UK Biobank
  - FinnGen datasets
- Used first reported date of an ICD10 sleep code but excluded codes occurring after neurodegenerative disorder diagnosis
  - F51 – Nightmares, generalized insomnia
  - G47 – Narcolepsy, apnea, hypersomnia, parasomnia, sleep movement disorders
- Associations seen across multiple biobanks

Simmonds E et al., medRxiv [Preprint]. 2023 Nov 9:2023.11.08.23298037. doi: 10.1101/2023.11.08.23298037.

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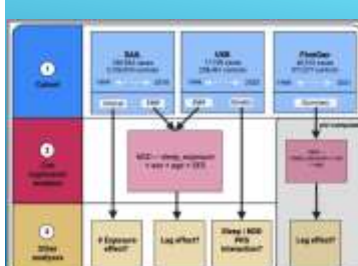

STUDY DESIGN

Simmonds E et al., medRxiv [Preprint]. 2023 Nov 9:2023.11.08.23298037. doi: 10.1101/2023.11.08.23298037.

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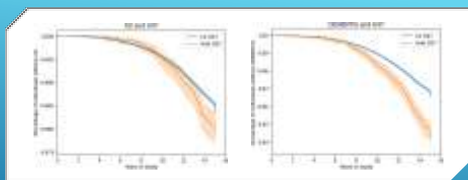
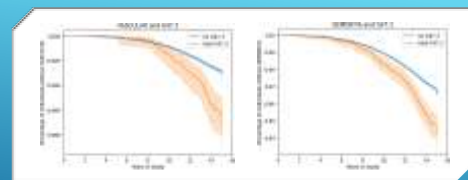


INCREASED RISK OF AD OR DEMENTIA WITH G47 (SLEEP DISORDER) DIAGNOSES

Simmonds E et al., medRxiv [Preprint]. 2023 Nov 9:2023.11.08.23298037. doi: 10.1101/2023.11.08.23298037.

19



INCREASED RISK OF DEMENTIA OR VASCULAR DEMENTIA WITH G47.3 (SLEEP APNEA)

Simmonds E et al., medRxiv [Preprint]. 2023 Nov 9:2023.11.08.23298037. doi: 10.1101/2023.11.08.23298037.

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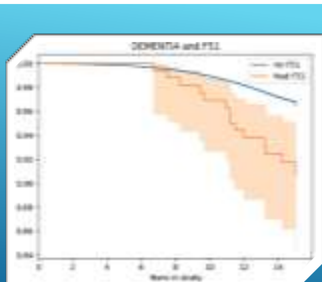
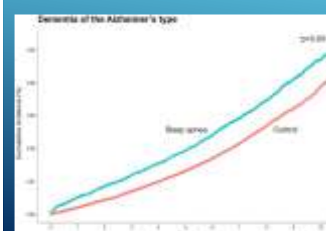


INCREASED RISK OF DEMENTIA WITH F51

Simmonds E et al., medRxiv [Preprint]. 2023 Nov 9:2023.11.08.23298037. doi: 10.1101/2023.11.08.23298037.

21

SLEEP APNEA-RELATED RISK OF AD



- Assessed association between sleep apnea and incident dementia (AD and vascular dementia) in subjects ≥ 50 years from Korean National Health Insurance Service.
- N=30,111 with sleep apnea, 121,528 controls without sleep apnea

Chung SJ et al., Alzheimer's Research & Therapy 17:65, 2025.

22

SLEEP APNEA-RELATED RISK OF AD GREATER IN WOMEN

- Risk of AD related to sleep apnea greater in women
- Sleep apnea with obesity increased AD risk in women but not men

Chung SJ et al., Alzheimer's Research & Therapy 17:65, 2025.

23

IS SLEEP APNEA CAUSALLY ASSOCIATED WITH AD?

- Used summary statistics from 4 GWAS studies of sleep apnea to perform Mendelian randomization (MR) analyses (n=523,366 with 25,008 cases of sleep apnea)
- MR analyses used to evaluate causality between genetic liability of sleep apnea (based on SNPs) on outcomes
- Genetically predicted SA did not influence risk of AD, and genetically predicted AD did not influence risk of SA

Cavailles C et al., J Am Heart Assoc 13(18):e033850, 2024.

24

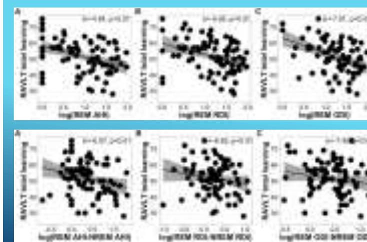
EFFECTS OF OSA ON VERBAL MEMORY IN SUBJECTS AT RISK FOR AD

- N=81 adults underwent clinical polysomnography including assessment of OSA
  - Mean age: 61.6±6.0 y/o, 62% women
  - 31.7% apolipoprotein E ε4 allele (*APOE4)* carriers, 69.5% with parental history of AD
- Verbal memory learning and recall tested (Rey Auditory Verbal Learning Test; RAVLT)
- Relationships between OSA and RAVLT scores assessed, adjusting for sex, age, time between assessments, education years, and *APOE4* status or parental history of AD
- Significant main effects of OSA features on RAVLT and moderating effects of AD risk factors (i.e., sex, age, *APOE4* status, and parental history of AD) examined in these models

Liu K, Mander B, Benca R et al. Alzheimers Res Ther 16(1):102, 2024.

25

OSA SEVERITY BY SLEEP STAGE AND LEARNING

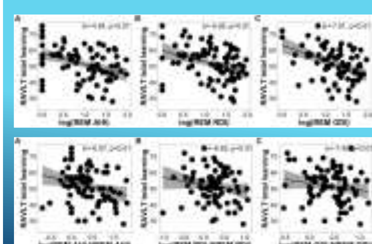


- Greater AHI, RDI, & ODI were significantly associated with impaired learning ability
- REM ODI FDR significant
- Relationships more specific to REM sleep (all NREM p>0.40)
- The degree of REM dominant AHI, RDI, and ODI predicted impaired learning ability
- Relationships driven by events, but not REM duration per se

Liu K, Mander B, Benca R et al. Alzheimers Res Ther 16(1):102, 2024.

26

OSA SEVERITY BY SLEEP STAGE AND DELAYED RECALL

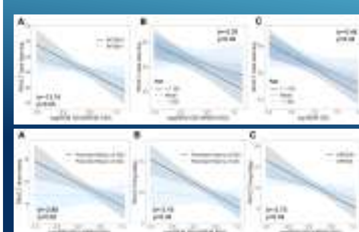


- Greater AHI, RDI, and ODI were significantly associated with impaired memory retention (FDR)
- Relationships more specific to REM sleep (all NREM p=0.93)
- Steiger's Z revealed correlations differed by sleep stage for AHI (p=0.004) and ODI (p=0.03)
- The degree of REM dominant AHI, RDI, and ODI predicted impaired memory retention

Liu K, Mander B, Benca R et al. Alzheimers Res Ther 16(1):102, 2024.

27

AGE, APOE4 STATUS, AND PARENTAL HISTORY MODERATE MEMORY ASSOCIATIONS



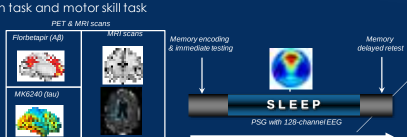
- AD risk factors moderate associations between REM-related OSA severity and learning & memory
- **Note:** These moderation effects occur in a largely Aβ- cohort that is at risk for AD.

Liu K, Mander B, Benca R et al. Alzheimers Res Ther 16(1):102, 2024.

28

Sleep Apnea, Local Sleep & Alzheimer's (SALSA) study

- 40 clinically intact older adults (72.3±5.8 y/o, 26 women) recruited from the UCI BEACoN Cohort (PI Yassa) completed to date; enriched for OSA with STOP-BANG questionnaire screening (PSG AHI: 14.0±17.6, range 0.5-79.8)
- MRI data used to assess white matter hyperintensities (WMH), MTL structure
- In-lab clinical PSG with hdEEG (128 channels); focus on hypoxemia severity (minimum O_2 saturation)
- Sleep-dependent memory assessed before and after sleep with emotional pattern separation task and motor skill task



Berisha D et al., Neurology 104 (11), 2025.

29

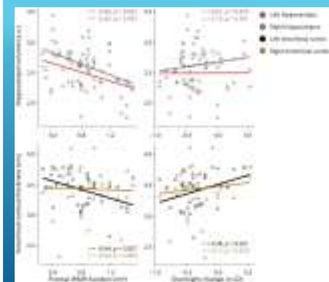
REGIONAL WMH VOLUME AND HYPOXEMIA SEVERITY IN REM SLEEP

- Associations between REM sleep SpO_2 nadir and WMH volume strongest in fronto-parietal cortex
- Could cerebrovascular pathology be a candidate mechanism?

Berisha D et al., Neurology 104 (11), 2025.

30

Frontal WMH and MTL Structure

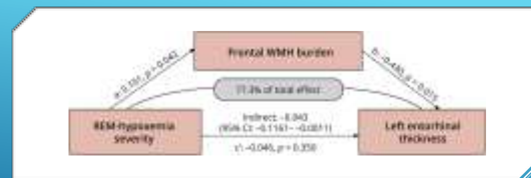


Left: Frontal WMH burden associated with decreased hippocampal volume and entorhinal cortical thickness

Right: Hippocampal volume and entorhinal cortical thickness positively associated with mnemonic discrimination ability

Berisha D et al., Neurology 104 (11), 2025.

31

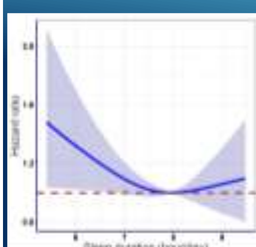


REM-related hypoxemia may be more significant for cognitive impairment in older adults

Berisha D et al., Neurology 104 (11), 2025.

32

Sleep Duration and Regularity Associated with Incident Dementia



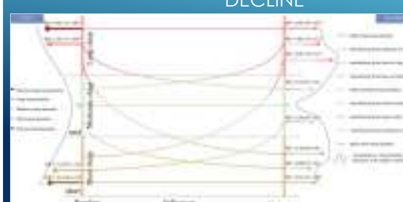
- Prospective actigraphy study of 82,391 adults (43-79 y/o) with 7.9 yrs mean follow-up
- Short sleep (<7h) and less sleep regularity associated with dementia risk

SRI

Bian W. et al., BMC Public Health 25:516, 2025.

33

Meta-Analysis: Sleep Duration and Cognitive Decline

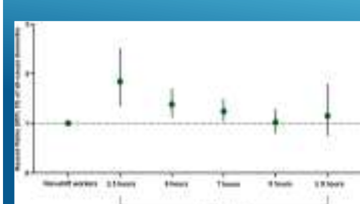


- 49 cohort studies, 10.8 million subjects, mean follow-up 9.1 yrs
- Increased risk with:
  - Long and short sleep duration
  - Hypersomnia
  - Insomnia
  - Transition from short or moderate to long sleep duration

Yang Q et al., Neurosci Biobehav Rev 164:105817, 2024.

34

Short Sleep Duration in Shift Workers Associated with Increased Dementia Risk



285,213 UK Biobank subjects (49,079 shift workers without dementia at baseline, 38-71 y/o)

Median follow-up 13.8 yrs

Dementia risk higher in shift workers who obtained <8h of sleep/night

Suggests 8h sleep may eliminate excess dementia risk in shift workers

Chang J et al., J Neurol 271(9):6056-6067, 2024.

35

Relationship of Rest-Activity Rhythms and Brain Structure in Older Adults at Risk for Dementia

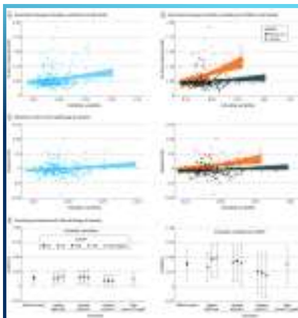
- 143 adults (≥50 y/o; mean age 67 y/o) with subjective and/or objective cognitive impairment
- MRI scan and 14-d actigraphy

Lower intra-daily variability (IV) associated with regions of greater cortical thickness (*left panel*); lower inter-daily stability (IS) associated with regions of lower cortical thickness (*right panel*)

Greater fragmentation and reduced stability of RARs in older adults at risk for dementia associated with reduced cortical thickness in frontal, temporal, parietal, and occipital regions

Espinosa N et al., Sleep zsaf017, 2025.

36



ACTIVITY RHYTHMS PREDICT Aβ PATHOLOGY

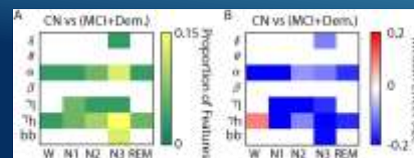
- 319 adults (48-80 y/o) without dementia underwent actigraphy and Aβ after mean follow-up of 7.8 (2.4) yrs
- More fragmented RAR associated with greater Aβ burden, stronger in *APOE4* carriers
- Similar relationship after excluding subjects with AD pathology at baseline, suggests fragmented RAR precedes Aβ deposition

Nguyen Ho PT et al., JAMA Neurol 81(8):824-834, 2024.

37

AMBULATORY EEG FEATURES PREDICT FUTURE RISK OF COGNITIVE IMPAIRMENT

- PSG in cognitively normal women (mean age ~82 y/o, n=281); cognitive assessment ~5yrs later
- Moderate-to-good prediction of developing cognitive impairment, particularly from EEG features from N3 and gamma band



Haghayegh S et al., J Alzheimers Ds 4:13872877251319742, 2025.

38

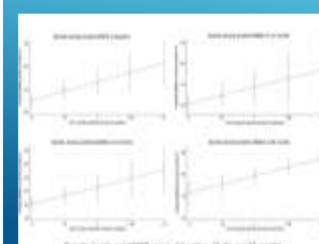
SPINDLES AND SOS PREDICT COGNITION AND AD BIOMARKERS IN MILD-MODERATE AD

- Prospective study of 104 subjects with mild-moderate AD/ADRD, age ≥60 y/o

Paez A et al., Alzheimers Dement 21(2):e14424, 2025.

39

SPINDLES AND SOS PREDICT COGNITION AND AD BIOMARKERS IN MILD-MODERATE AD



- Prospective study of 104 subjects with mild-moderate AD/ADRD (age ≥60 y/o)
- Cognition assessed 12, 24 and 36 months after PSG + blood, CSF collection
- Spindle duration, density, and power associated with better cognition at all time points

Paez A et al., Alzheimers Dement 21(2):e14424, 2025.

40

SPINDLES, SOS AND COGNITION IN AD

(A) Spindle and SO activity mediated effect of pTau181/ab42 on cognition

- SO duration suppressed negative effect of pTau181/ab42 on MMSE score)

(B) pTau181/ab42 moderated effects of spindles and SOs on cognition

Paez A et al., Alzheimers Dement 21(2):e14424, 2025.

41

META-ANALYSIS OF SLEEP MACRO-ARCHITECTURE AND DEMENTIA RISK

- Data from 5 US-based cohort studies from Sleep and Dementia Consortium
- 4,657 subjects aged >60 y/o (mean: 74 y/o), 30% women
- 998 (21.4%) dementia cases, median follow-up time 5-19 yrs
- Percent time in N1, N2, N3, REM, WASO and SE from 1-night at-home PSG
- Across 5 cohorts (ARIC, Atherosclerosis Risk in Communities study; CHS, Cardiovascular Health Study; FHS, Framingham Heart Study; MrOS, Osteoporotic Fractures in Men Study; SOF, Study of Osteoporotic Fractures), **no associations** found between sleep variables and dementia risk.

Yiallourou S. et al., medRxiv [Preprint]. 2024 Nov 5:2024.11.05.24316677.

42

PART 2- AUTISM

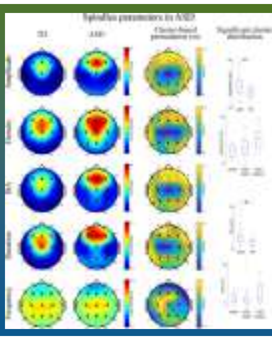
43

SLEEP EEG OSCILLATION ABNORMALITIES IN AUTISM

- Sleep spindles implicated in learning and abnormalities in spindle development in childhood reported in autism spectrum disorder (ASD)
- Sleep recorded during afternoon naps in typically developing (TD) and ASD children ages 2-6
- 50 children studied, including TD children (n=18) and those with ASD (n=32)
- ASD children included
  - ASD diagnosis only (ASDo) (n=6)
  - Co-occurring General DevelopmentalDelay (ASD-GDD) (n=19)
  - Both GDD and EEG epileptic abnormalities (ASD-GDD-E, without clinical history of epilepsy and free from EEG seizures) (n=7)

D'Ambrosio S et al., Autism Research 0:1-11, 2025.

44



SLEEP EEG OSCILLATION ABNORMALITIES IN AUTISM

- Significant increases in sleep spindle (sigma) seen in frontal regions
- Increases in adjacent alpha and beta power also seen
- No differences in delta, theta or gamma power
- Naps sufficient to detect abnormalities in sleep oscillations in children

D'Ambrosio S et al., Autism Research 0:1-11, 2025.

45

PART 3- CLIMATE CHANGE

46

EFFECTS OF CLIMATE WARMING ON SLEEP DURATION AND QUALITY

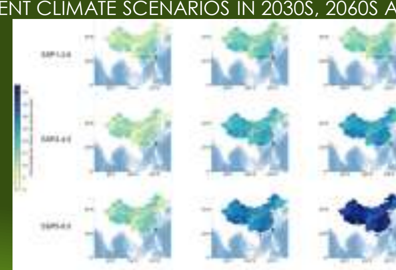
Parameters	Estimate (95%CI)
Percentage change (%)	
Sleep insufficiency	20.1 (19.9, 20.3)
Absolute change (min)	
Total sleep duration	−9.67 (−9.74, −9.60)
Light sleep duration	−4.04 (−4.09, −4.00)
Deep sleep duration	−3.58 (−3.62, −3.55)
Dream sleep duration	−2.01 (−2.04, −1.99)
Absolute change (%)	
Light sleep proportion	−2.02 (−2.05, −2.00)
Deep sleep proportion	−2.82 (−2.85, −2.80)
Dream sleep proportion	−2.20 (−2.22, −2.17)

- Sleep monitoring data from 214,445 subjects across mainland China for 23 million days
- Effect of daily average temperature on sleep analyzed
- Table: %age change in odds of various sleep parameters associated with each 10 °C temp increase

Li A et al, Nat Commun 16:2609, 2025

47

PROJECTED PERCENTAGE INCREASES IN SLEEP LOSS UNDER DIFFERENT CLIMATE SCENARIOS IN 2030S, 2060S AND 2090S



Li A et al, Nat Commun 16:2609, 2025

48

PART 3A- CLIMATE CHANGE AND SLEEP APNEA

https://news.flinders.edu.au/blog/2025/06/17/climate-change-linked-to-dangerous-sleep-apnea/

49

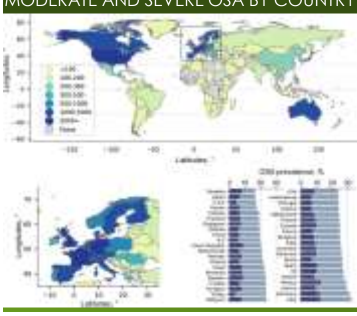
RELATIONSHIP BETWEEN HIGHER AMBIENT TEMPERATURES AND OSA

- Data from 116,620 adult subjects who used under-mattress sleep sensor (Withings Sleep Analyzer) $\geq$ 28 nights with $\geq$ 4 nights data/week between Jan 2020 and Sept 2023
- Weather information time-matched for each day of data for each user based on their closest location, collected from the Copernicus Climate Change Service
- Subjects were 77.3% male, mean age 49

Lechat B et al., Nat Commun 16:5100, 2025.

50

MODERATE AND SEVERE OSA BY COUNTRY

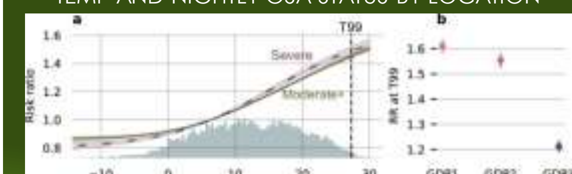


- Geographical location of under-mattress regular users on maps
- OSA prevalence by country:
  - Lt blue – AHI 15-30
  - Dk blue – AHI $\geq$ 30

Lechat B et al., Nat Commun 16:5100, 2025.

51

EXPOSURE-RESPONSE BETWEEN DAILY AMBIENT TEMP AND NIGHTLY OSA STATUS BY LOCATION

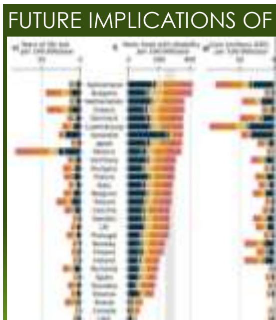


a. Probability of having OSA **45% higher** (risk ratio (RR) [95%CI]: 1.45 [1.44, 1.47]) **on nights following days with high temperatures** (99th; 27.3 °C) vs. following days with lower temperatures (25th; 6.4 °C). Probability of having severe OSA was 49% (1.49 [1.46, 1.52] higher in high vs. low temperature days.
b. Probability of nightly OSA higher at T99 in countries with lower gross domestic product (GDP) per capita

Lechat B et al., Nat Commun 16:5100, 2025.

52

FUTURE IMPLICATIONS OF GLOBAL WARMING ON OSA



- Wellbeing and economic impact of estimated temperature-related increases in OSA by 2100 for different climate scenarios from the IPCC calculated for (**e**) YLL, (**f**) YLD, and (**g**) wellbeing economic cost (rate per 100,000 persons per year)

Lechat B et al., Nat Commun 16:5100, 2025.

53

IMPLICATIONS

- Increased OSA prevalence in 2023 due to global warming associated with loss of 788,198 healthy life years, and productivity loss of ~105 million days in the 29 studied countries.
- In 2023, estimated economic cost associated the increased OSA prevalence was ~98 billion USD.
- Global warming modelled to increase by 2.1 to 3.4 °C by 2100. The increase in OSA prevalence due to rising temperatures may double the overall OSA burden.

Lechat B et al., Nat Commun 16:5100, 2025.

54

PART 4- ANIMAL RESEARCH

55

APRIL 2025: THE U.S. NATIONAL INSTITUTES OF HEALTH (NIH) HAS ANNOUNCED THAT IT WILL NO LONGER ISSUE FUNDING OPPORTUNITIES THAT REQUIRE THE USE OF ANIMAL MODELS

"In Landmark Shift, NIH Announces No More Exclusive Funding for Animal Experiments." *Physicians Committee for Responsible Medicine*, www.pcrm.org/news/news-releases/landmark-shift-nih-announces-no-more-exclusive-funding-animal-experiments. Accessed 18 Aug. 2025.

56

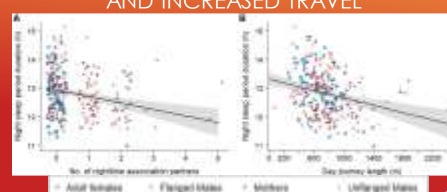
- Orangutans sleep in nests at night and during the day
- Sleep period defined as time in the nest during daytime without movement/vocalization, and nighttime sleep defined as time in nest after movement and vocalizations ceased and before they began

SLEEP HOMEOSTASIS IN ORANGUTANS IN THE WILD IN SUMATRA

Ashbury a et al., Current Biology 13:3163-3173, 2025.

57

SHORTER NIGHTTIME SLEEP WITH MORE PARTNERS AND INCREASED TRAVEL

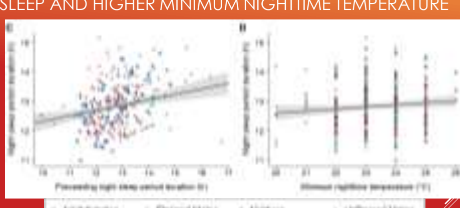


Orangutans had shorter nighttime sleep periods (A) they had more nighttime association partners and (B) they traveled farther on the preceding day.

Ashbury a et al., Current Biology 13:3163-3173, 2025.

58

LONGER NIGHTTIME SLEEP AFTER A LONG PRIOR NIGHT OF SLEEP AND HIGHER MINIMUM NIGHTTIME TEMPERATURE

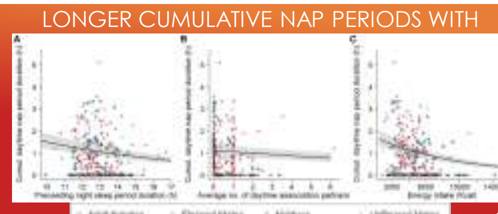


Orangutans had longer nighttime sleep periods when (C) the duration of their nighttime sleep period during the preceding night was longer and (D) the minimum nighttime temperature was higher.

Ashbury a et al., Current Biology 13:3163-3173, 2025.

59

LONGER CUMULATIVE NAP PERIODS WITH

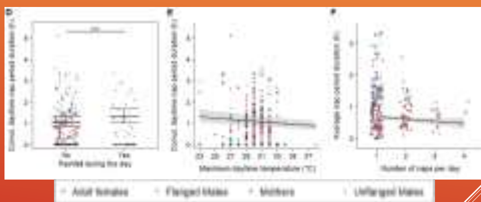


(A) a shorter nighttime sleep period the preceding night, (B) association with fewer association partners over the course of the day, (C) lower total energy intake

Ashbury a et al., Current Biology 13:3163-3173, 2025.

60

LONGER CUMULATIVE NAP PERIODS WHEN



(D) there was rain during the day, (E) the maximum daytime temperature was lower, (F) their nap periods were, on average, shorter.

Orangutans use daytime naps to compensate for lost sleep at night

Ashbury a et al., Current Biology 13:3163-3173, 2025.

61

SLEEP HOMEOSTASIS IN ORANGUTANS: CONCLUSIONS

- *Orangutans use daytime naps to compensate for lost sleep at night*
- *Social and ecological factors lead to variations in nighttime sleep and daytime naps*
- *"The costs and benefits of sleep are traded off with those of other critical activities, such as travel and sociality."*

Ashbury a et al., Current Biology 13:3163-3173, 2025.

62

FIRST NIGHT EFFECT IN HORSES

- Horses often transported to new locations for sporting events
- Horses from professional sports horse barn who were frequently transported (n=5) compared to horses from a breeding barn who were not (n=6)
- EEG recorded to detect First Night Effect, comparing sleep in the home box to a guest box (1 night each)

Bergeler J et al., Sci Rep 15(1):30075, 2025.

63

SLEEP PATTERNS

- No significant differences in feeding, lying down or drowsiness between home and guest boxes for either group of horses
- Sport horses tended to spend more time lying down, significant only for home box

Bergeler J et al., Sci Rep 15(1):30075, 2025.

64

First night effect in horses: *Results and conclusions*

- No clear First Night Effects based on behavioral data
- EEG recordings showed evidence of First Night Effect in both groups of horses
- Interhemispheric correlations between electrode pairs greater in the guest boxes for both groups
- Occipital delta band intrahemispheric coherence increased in the 1 Hz delta range and up to 3Hz in the guest box compared to home box in both groups
- Findings interpreted as showing a higher degree of arousal during sleep
- Even sport horses show evidence of sleep disturbance in novel settings

Bergeler J et al., Sci Rep 15(1):30075, 2025.

65

PART 5- WAKING UP

66

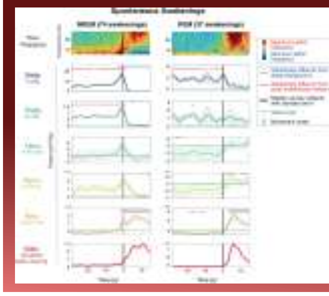
HOW THE BRAIN AWAKENS AFTER SLEEP

- 20 normal subjects (38.3± 7.4y)
- Sleep recorded with hdEEG (256 electrodes)
- 1,073 awakenings and arousals recorded

Stephan AM et al., Current Biology 35(16):3812-3824.e3, 2025.

67

GLOBAL CHANGES IN POWER DURING AWAKENINGS

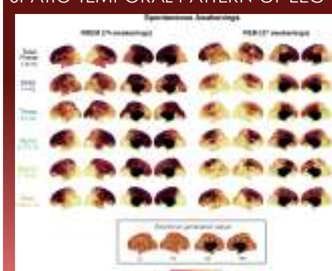


- In awakenings and arousals from NREM sleep, transient increases in low-frequency EEG power precede increases in high-frequency power
- In awakenings from REM sleep, only increases in high-frequency power observed

Stephan AM et al., Current Biology 35(16):3812-3824.e3, 2025.

68

SPATIO-TEMPORAL PATTERN OF EEG CHANGES IN AWAKENING



- Low-frequency changes in NREM awakening start in centro-parietal areas, then proceed frontally and reach occipital and inferior temporal regions last
- High frequency changes in both NREM and REM awakenings start frontally and are seen last in occipital and inferior temporal regions

Stephan AM et al., Current Biology 35(16):3812-3824.e3, 2025.

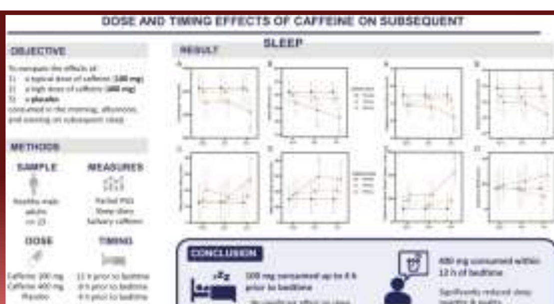
69

SPATIO-TEMPORAL PATTERN OF EEG CHANGES IN AWAKENING

- Full awakenings usually preceded by a type I K-complex
- Frequency gradient:
  - Intralaminar thalamic nucleus (subcortical activation) drives K-complex (short)
  - Locus coeruleus drives high-frequency activity (sustained activation)
- Understanding how the brain awakens may be relevant for clinical conditions such as parasomnias and insomnia

Stephan AM et al., Current Biology 35(16):3812-3824.e3, 2025.

70



Gardiner CL et al., SLEEP 48(4):zsae230, 2025.

71

QUESTIONS?

72