

SINGAPORE SLEEP REVIEW

SINGAPORE SLEEP SOCIETY NEWSLETTER

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PRESIDENT'S MESSAGE

With this November issue of the Singapore Sleep Review, we have reached the last issue for 2023. We are happy to bring you a new selection of research articles. In this issue we take a closer look at variability in sleep measures as they relate to health outcomes.



Sleep research has traditionally focused on average sleep metrics, but increasingly often, the variability of these metrics is recognized as a substantial factor influencing health. The articles in this issue look at variability in different sleep outcomes (duration, timing, respiratory events), and across different time scales (night-to-night, hour-to-hour). Furthermore, we are happy to announce the Singapore Sleep Conference 2024. We hope to welcome you all to join this exciting event.

Dr Sridhar Venkateswaran
President, Singapore Sleep Society

Singapore Sleep Conference 2024

On 22 and 23 March 2024, The Duke-NUS SingHealth Sleep Centre will organize the Singapore Sleep Conference 2024. This event will bring together sleep medicine professionals and scientists from all over Singapore and abroad to learn, share, and connect.

The Singapore Sleep Society is a proud supporting partner of the SSC2024. We are looking forward to an exciting programme of workshops and lectures. We invite all members and sleep enthusiasts to join us in March.

Abstracts can be submitted before 4 December 2023, and registration is opened now until 7 March 2024.

www.sgsleepconference2024.com



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EPIDEMIOLOGY

Sleep regularity predicts mortality more strongly than sleep duration

HYPERTENSION

Day-to-day variability in OSA severity is associated with hypertension risk

INTERVIEW

Hour-to-hour variability in respiratory sleep indices linked to blood pressure outcomes

ADOLESCENTS

Higher sleep variability in adolescents is associated with poorer mood



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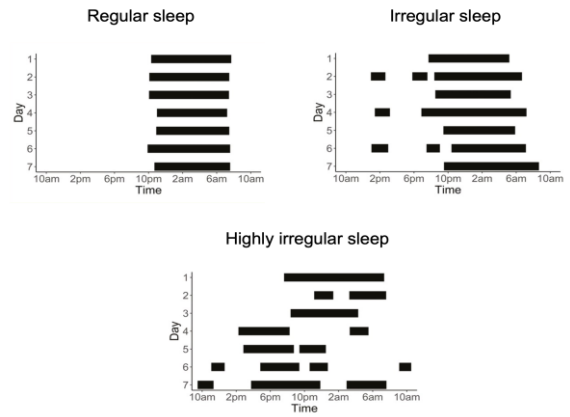
Sleep regularity is a stronger predictor of mortality than sleep duration

Reference: Windred, et al., Sleep regularity is a stronger predictor of mortality risk than sleep duration: A prospective cohort study, SLEEP, 2023; zsad253, <https://doi.org/10.1093/sleep/zsad253>

Short sleep is a known risk factor for mortality. An analysis of the UK Biobank data reveals that irregularity of sleep duration could be an even stronger predictor.

The UK Biobank is an open-source epidemiological data base that has aggregated in-depth, longitudinal health data from over half a million middle-aged participants in the UK. Among the data collected are sleep/activity records from a wrist-worn actigraphy device, which is used to quantify sleep patterns over a one-week period. Traditional epidemiological studies have focused on the average sleep duration as a predictor of health outcomes. However, irregular sleep (both in timing and duration) is increasingly recognized as a risk factor.

This study analysed mortality records of 60,977 participants who had completed prior actigraphy recordings. Day-to-day variability in sleep/wake status were quantified as the Sleep Regularity Index (SRI) was calculated. This metric takes into account nocturnal sleep and naps and quantifies the similarity of the sleep pattern across days, by comparing whether a person was wake or asleep at the same time points from one day to the next.



Sleep regularity patterns (adapted from Windred, et al. 2023 SLEEP)

When looking at mortality records, it was found that those people with the lowest sleep regularity had a 48% higher mortality risk than those with the highest regularity due to all-cause mortality, and 55% and 39% increased due to cardiometabolic disease and cancer respectively. In comparison, those with the shortest average sleep duration (5.32hr) had 31% increased mortality risk compared to those with optimal sleep duration (7.28hr) and 22% increase compared those who slept the longest (7.94hr).

Sleep irregularity in this study could stem from irregular bed and wake timings, fragmented sleep, or weekday-weekend differences.

Conclusion
 Sleep regularity is an important determinant of healthy sleep and should therefore be encouraged in patients and general populations.

A meta analysis shows **the risk for incident diabetes is 63% higher** in people with **moderate to severe obstructive sleep apnea.***

Explore the link between diabetes and sleep health. Click for a collaboration.



*Reference: Wang X, Bi Y, Zhang Q, Pan F. Obstructive sleep apnoea and the risk of type 2 diabetes: a meta-analysis of prospective cohort studies. *Respirology* 2013;18:140-146

Night-to-night variability in OSA severity linked to hypertension

Reference: Lechat, et al. High night-to-night variability in sleep apnea severity is associated with uncontrolled hypertension. *NPJ Digit. Med.* 6, 57 (2023).

<https://doi.org/10.1038/s41746-023-00801-2>

While patients can differ in the average severity of obstructive sleep apnea (OSA) symptoms, they can also experience substantial variability in symptom severity from night to night. Long-term at-home monitoring can reveal such night-to-night variability and can begin to uncover associated health consequences.

In this study, data from a consumer wearable sleep tracking device were analysed (Withings Sleep Analyzer). Participants were individuals who had purchased the device for personal use, and had agreed for their deidentified data to be used for research purposes. The Withings is a sensor pad that is placed under the mattress and monitors movement, breathing, and heart rate. While the device technology is still pending FDA clearance, validation studies show that high sensitivity and specificity for detecting OSA severity.

For this analysis, data from 12,287 users who had contributed an average of 180 nights of sleep data, and had taken regular blood pressure recordings were used. OSA severity and variability were calculated as the average Apnea-Hypopnea Index (AHI) and the night-to-night standard deviation of the AHI. Uncontrolled hypertension was defined as a mean systolic blood pressure ≥ 140 mmHg or mean diastolic blood pressure ≥ 90 mmHg. Both average OSA severity and OSA variability were associated with increased hypertension prevalence. Those individuals with the highest AHI had 54% higher risk of hypertension compared to those with the lowest AHI, while the highest OSA variability was associated with an 46% increase in hypertension risk.



For the measurement of night-to-night variability measures, analysis of a consumer user-base allows for monitoring of a large number of participants, over a long period of time, in their natural sleep environment. However, it should be noted that the database did not have information on diagnosis and/or treatment status of the participants. Therefore, some caution should be exercised to not interpret the study outcomes as a clinical diagnosis of OSA or hypertension.

Conclusion

These data suggest that not only the average severity of OSA but also the night-to-night variability in OSA severity are risk factors for hypertension.

Disclaimer: This publication is not intended as a replacement of regular medical education. The reviews are a summarized interpretation of the published studies and reflect the opinions of the writer rather than those of the original research group or the scientific journal. It is suggested that the reader reviews the full trial data before forming a final conclusion on its own merits.

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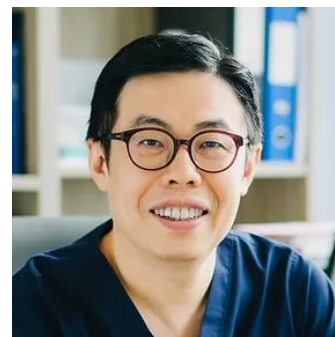
Interview: Hour-to-hour variability of respiratory sleep indices and blood pressure

Reference: Seah, et al., Hour-to-hour variability of respiratory sleep indices and ambulatory blood pressure, *SLEEP*, 46, 2, 2023, zsac227
<https://doi.org/10.1093/sleep/zsac227>

The occurrence of respiratory sleep events can vary on a night-by-night basis, but additionally, it can vary from hour-to-hour during a night of sleep. A recent study from the National University of Singapore showed that the extent of hour-by-hour variability in the Apnea-Hypopnea Index (AHI) and Oxygen Desaturation Index (ODI) over the night were associated with increased blood pressure (BP) in patients with hypertension.

The team led by prof Ronald Lee Chi-Hang, from the Yong Loo Lin School of Medicine at NUS monitored 146 hypertension patients via an in-lab sleep study. 106 of these patients met diagnostic criteria for OSA and were further followed with 24h ambulatory BP measurement. The main outcome measure was pulse pressure, an indication of arterial stiffness. Results showed that AHI and ODI changed over the night, showing an increase in the earlier half of the night, and a decrease toward the end of the night, “*which I believe was related to the effect of different sleep stages*”, prof Lee explains. Higher AHI and ODI variability were associated with higher pulse pressure and systolic blood pressure. Associations with pulse pressure remained significant after controlling for confounding factors such as age, sex, BMI, and previous stroke, average AHI/ODI, number of hour-to-hour polysomnogram reports, and percent time of REM sleep. These findings indicate that hour-to-hour respiratory sleep indices can be independently associated with cardiovascular health outcomes. While the use of variability metrics is more common in other

fields, OSA indices are not often analysed as a nightly average only. Lee, who is a cardiologist by training, explains what brought him to this approach:



prof Ronald Lee Chi-Hang

“Variability of many cardiovascular parameters have been shown to be independent predictors of adverse cardiovascular outcomes. These include variability of blood pressure, heart rate, and LDL cholesterol. I transferred this idea to sleep medicine, and to my surprise, AHI variability was also shown to be independently associated with blood pressure.”

The study results are promising and open novel avenues for research. Still, Lee remains cautious when asked whether the study results would generalize to non-hypertensive patients with OSA:

“For patients without hypertension, their 24-hour systolic blood pressure should be below 130 mmHg. Therefore, it would be very difficult to demonstrate a relationship between AHI variability and blood pressure.”

With regards to potential clinical applications, he says: *“Being a researcher, I am excited to see the interesting findings. Yet, it is hypothesis-generating only. The same finding needs to be replicated in future studies. Moreover, the AHI variability needs to be an actionable metric before it could be translated to clinical practice.”*

Conclusion

Respiratory sleep indices vary over the course of the night. This variability can be indicative of cardiovascular risk outcomes. Further validation is warranted still.



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Sleep duration and variability and student 'readiness'

Reference: Ng, et al. (2023), Assessing 'readiness' by tracking fluctuations in daily sleep duration and their effects on daily mood, motivation, and sleepiness. *Sleep Med*, 112: 30-38. <https://doi.org/10.1016/j.sleep.2023.09.028>

In order to perform and interact effectively in a dynamic and demanding environment, one must not only be awake, but also be ready to face the technical and emotional challenges of the day.

This recently published study aimed to investigate how our self-rated mood, motivation, and sleepiness levels are affected by daily fluctuations in sleep duration, timing, and efficiency and overall sleep regularity. 119 university students were monitored for two to six weeks using a wearable sleep tracker (Oura ring). Twice daily, participants provided daily reports of their mood, motivation, and sleepiness via a phone app. Findings showed that day-to-day fluctuations in sleep duration were predictive of experienced mood, motivation, and sleepiness the next day. In addition, daytime naps were shown to reduce post-nap sleepiness and improve mood. Overall variability of sleep duration over the monitoring period was associated with worse mood and lower motivation after waking. In contrast, a participant's average sleep duration did not predict their average mood, motivation, and sleepiness ratings.

Conclusion

Mood, motivation, and sleepiness reflect mental readiness and are affected by both day-to-day fluctuations in sleep duration, and by overall variability in sleep duration.

Sleep variability and mood in adolescents

Reference: Matthew, et al. Actigraphic Sleep Variability is Associated With Lower Positive Mood in Adolescents. *J Adol Health*. 2023;73:478-485. <https://doi.org/10.1016/j.jadohealth.2023.04.019>

Adolescent sleep is under the influence of developmental as well as societal factors. Variability in sleep timing and duration can also negatively impact on wellbeing outcomes in this age groups.

The title of this work highlights its main finding and strengthens the evidence for sleep variability as a moderator of mental wellbeing. 580 adolescents averaging 16 years of age, provided at least three nights of actigraphy, and reports of mood. The work was part of a large-cohort study examining family influences on child wellbeing. Sleep variability was characterized via the deviation in sleep duration and a metric called the SRI measured the extent to which sleep periods matched one another across nights. A higher level of both measures was associated with lower ratings of positive mood. This finding complements work in other populations finding that shorter sleep duration is also linked to poorer positive mood and should be heeded by parents, educators and public policy makers.

Conclusion

Adolescents with higher variability in sleep duration and/or timing report lower positive mood ratings. This may increase the risk of poorer psychological health outcomes.



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SINGAPORE SLEEP CONFERENCE 2024

22 AND 23 MARCH 2024

Academia, 20 College Road, Singapore 169856

*Better Sleep for a
Healthier Life*

Organised by the SingHealth Duke-NUS Sleep Centre, the Singapore Sleep Conference 2024 is designed for Respiratory, Neurology, Psychiatry, Psychology, Dental, Paediatrics, Family Medicine and ENT specialists, and doctors in training, allied health professionals and nurses who have an interest in managing sleep disorders, and obstructive sleep apnea in children and adults.

The 2-day conference consisting of lectures, discussions and workshops on different topics in sleep medicine / sleep apnea surgery and research, with the aim of providing evidence-based knowledge for clinicians to advance the clinical practice of Sleep Medicine.

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6 OCT – 4 DEC 23**

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6 OCT 23 – 7 MAR 24**

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We invite research-based abstracts from Doctors, Allied Health Professionals, Nurses, Sleep Technologists and Students in the field of Sleep Medicine. This includes the following areas of focus:



**Basic Sleep
Science**



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Breathing**



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Accepted abstracts will be eligible for the **Best Poster Award**.

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for more information



CALENDAR

2023

24 NOV

SingHealth Duke-NUS x NLB Webinar

“Common Sleep Problems and Available Treatments” by dr Alvin Tan

Date: Friday, 24 Nov 2023, 12:30 - 2pm

<https://for.sg/sdsleepnlbwebinar>

28 NOV

Virtual Health Talk - SKH

“Better Sleep for Better Wellbeing” by Sengkang General Hospital

Date: Tuesday, 28 Nov 2023, 11:15am – 1:15pm

www.skh.com.sg/events/better-sleep-for-better-wellbeing/better-sleep-for-better-wellbeing

10-13 DEC

ASSM 2023

4th Congress of the Asian Society of Sleep Medicine, Bangkok, Thailand
Including WSS Sleep Medicine Exam

<https://assm2023-bangkok.com/>

2024

22-23 MAR

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Associate members:

\$10/year – any person involved in the field of sleep disorders without the above qualification.

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