

PRESS RELEASE

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How short is too short? Long-term wearable data point to a more personal way of defining insufficient sleep

NUS researchers show that comparing sleep with an individual's own long-term pattern can reveal sleep shortfall that fixed nightly cut-offs may miss

Singapore, 6 October 2026 — How much sleep is enough? Public-health recommendations necessarily give population-level answers. But with wearable devices now capable of recording hundreds of nights from the same person, researchers from the National University of Singapore (NUS) have asked whether short sleep could also be assessed relative to an individual's own sleep pattern.

A new study from the Centre for Sleep and Cognition at NUS Yong Loo Lin School of Medicine introduces a personalized short sleep (pSS) framework. Instead of asking only whether someone slept less than a universal cut-off, it asks: was this night substantially shorter than what this person usually achieves when they have greater opportunity to sleep?

Published in [*Sleep Medicine*](#), the study followed 462 working adults using Oura Rings and daily smartphone assessments for up to one year. Researchers compared the commonly used definition of short sleep—less than six hours per night—with a personalized threshold derived from each participant's long-term sleep distribution.

The personalized threshold was set at one hour below the 75th percentile of each person's sleep duration. The upper part of an individual's sleep distribution provides a practical estimate of sleep obtained when occupational and social constraints are reduced, while the one-hour reduction was informed by experimental studies showing functional effects of sleep restriction.

The same amount of short sleep—but different nights

One of the study's most striking findings was that personalization did not simply classify more sleep as inadequate. Across the population, about 35% of nights were classified as short using the conventional six-hour threshold and about 37% using the personalized approach. The median personalized threshold was approximately 6.1 hours—remarkably close to the conventional six-hour cut-off.

Yet these similar population averages concealed substantial differences in which people and which nights were classified as experiencing short sleep. "That is the central idea behind this work," said Professor Michael Chee, senior author and Director of the [Centre for Sleep and Cognition](#) at the Yong Loo Lin School of Medicine at NUS. "Population thresholds remain useful, but once we have months of data from an individual, we can ask something they cannot tell us: *when is this person sleeping substantially less than is usual for them?*"

A habitual short sleeper with highly regular sleep may repeatedly fall below six hours even though shorter sleep is typical for that person. Conversely, someone who usually sleeps considerably longer could experience a substantial sleep shortfall while remaining above six hours.

The researchers emphasize that pSS is not a direct measurement of biological sleep need. Habitual sleep reflects sleep need, sleep opportunity, the ability to sleep and the demands of everyday life. Instead, pSS provides a pragmatic measure of relative sleep shortfall based on long-term observed behaviour.

Personalized short sleep tracked how people felt and functioned

The value of personalization became clearer when researchers examined what happened as short-sleep nights accumulated. Across all day-to-day outcomes studied, personalized short sleep showed larger effect estimates than the fixed six-hour definition. These included alertness, sleep satisfaction, stress, motivation, sadness, sleeping heart rate and heart-rate variability, sedentary behaviour and physical activity. Effects also increased with successive nights of short sleep.

The pattern extended to longer-term health measures. A higher proportion of personalized short-sleep nights showed stronger associations with body roundness index, systolic blood pressure, pulse-wave velocity and arterial stiffness.

One short night is common. Repeated shortfall may matter more

The year-long recordings also showed how different real-world sleep is from the prolonged sleep restriction commonly studied in laboratories. Most personalized short-sleep episodes were isolated. For 86.4% of participants, the median run of pSS was only one night, while longer sequences became progressively less common.

“An occasional short night is part of normal life,” said Chun Siong Soon, the study’s first author. “What appears more informative is whether substantial shortfalls keep recurring, and particularly whether they accumulate across consecutive nights.” The finding suggests that real-world sleep deficiency may often take the form of repeated intermittent shortfalls, rather than uninterrupted periods of severe sleep restriction.

Recovery sleep is constrained

After a single personalized short-sleep night, participants obtained approximately 50 minutes more sleep on the following weekday night. Surprisingly, additional consecutive short nights added less than ten minutes of further recovery per night. Weekend recovery was greater—up to about 1.25 hours—but even then recovery did not increase proportionally with accumulated short sleep and appeared to plateau after several nights.

These observations suggest that recovery from sleep shortfall is constrained by work schedules, social obligations and limits on how much additional sleep people obtain.

Similar patterns across seven countries

The researchers tested the broader applicability of their findings using anonymized data from 376,758 Oura users across Australia, Finland, Germany, Japan, Singapore, the United Kingdom and the United States. Sleep habits differed markedly between countries. Australia

showed earlier and longer sleep and fewer personalized short-sleep nights, while Japan showed later, shorter sleep and more frequent shortfall.

Yet despite these differences, the underlying pattern was strikingly similar: isolated short nights predominated, longer runs became progressively rarer, weekday recovery was limited, and weekend recovery was greater but did not increase indefinitely.

What wearables make possible

The researchers stress that personalized measures should complement rather than replace population sleep recommendations.

The significance lies instead in what long-term wearable measurement makes possible. A single night provides limited context. A month of nights can establish a personal reference against which unusually short sleep can be identified.

This could eventually help wearables move beyond simply reporting nightly sleep duration or generic scores toward identifying patterns of recurrent sleep shortfall that may be more functionally meaningful.

“Wearables give us an opportunity sleep science has never previously had at scale,” Professor Chee said. “How much you sleep matters, but our findings suggest that how often you fall substantially short of your own usual sleep matters too.”

The study concludes that personalized wearable-derived measures could help individuals identify recurrent sleep shortfall while avoiding over-interpretation of the occasional short night.

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Our multidisciplinary and real-world approach to education, research, and entrepreneurship enables us to work closely with industry, governments, and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, 30 university-level research institutes, research centres of excellence and corporate labs focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research, and cybersecurity.

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Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus in innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University Health System. It is one of the leading medical schools in Asia and ranks among the best in the world (Times Higher Education World University Rankings 2026 by subject and the Quacquarelli Symonds (QS) World University Rankings by Subject 2026).

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