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Sleep Duration, Timing, and Quality: How Smartphone Data Predict Labor Productivity

Researchers at University of Tsukuba examined the association between sleep characteristics and workplace productivity using real-world sleep data from approximately 80,000 users (spanning more than 2 million nights) of sleep-tracking smartphone applications. Their findings suggest that individuals classified as "social jet lag" and "insomnia-prone" types experience significantly reduced productivity.

Tsukuba, Japan—Most studies investigating the impact of sleep deprivation and circadian rhythm disruption on concentration and work performance have relied on self-reported questionnaires or small-scale surveys. To achieve an objective and large-scale assessment of habitual sleep behavior, this study analyzed data from around 80,000 Japanese workers using smartphone-based sleep applications. Parameters such as total sleep time, sleep latency, percentage of wake after sleep onset, chronotype, and discrepancies between weekday and weekend sleep timing (social jetlag) were examined. These metrics were linked to presenteeism scores (a validated measure of productivity loss) obtained using questionnaires.

Sleep duration demonstrated a U-shaped association with productivity, with short and long sleep duration linked to higher presenteeism. Additionally, individuals with longer sleep latency, frequent nocturnal awakenings, and greater social jetlag exhibited lower performance. Furthermore, unsupervised clustering using artificial intelligence techniques identified five distinct sleep phenotypes: "healthy sleepers," "long sleepers," "fragmented sleepers," "insomnia-prone," and "social jetlaggers." Productivity loss was the greatest in the "social jetlagger" and "insomnia-prone" groups, consistent across both sexes.

Therefore, apart from sleep duration, factors such as sleep timing, quality, and regularity are critical for maintaining work productivity. Moreover, smartphone-based sleep tracking can help identify at-risk individuals and guide personalized interventions to improve sleep health and occupational performance.

Correspondence

Professor Masashi Yanagisawa

International Institute for Integrative Sleep Medicine (WPI-IIIS), Tsukuba Institute for Advanced Research (TIAR), University of Tsukuba

URL: https://sleepymouse.jp/

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