New machine-learning method predicts body clock timing to improve sleep and health decisions

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A new machine-learning method could help us gauge the time of our internal body clock, helping us all make better health decisions, including when and how long to sleep.

The research, which has been conducted by the University of Surrey and the University of Groningen, used a machine learning program to analyze metabolites in blood to predict the time of our internal circadian timing system. The study is published in the journal *Proceedings of the National Academy of Sciences*.

To date the standard method to determine the timing of the circadian system is to measure the timing of our natural melatonin rhythm, specifically when we start producing melatonin, known as dim light melatonin onset (DLMO).

Professor Debra Skene, co-author of the study from the University of Surrey, said, "After taking two blood samples from our participants, our method was able to predict the DLMO of individuals with an accuracy comparable or better than previous, more intrusive estimation methods."

The research team collected a time-series of blood samples from 24 individuals—12 men and 12 women. All participants were healthy, did not smoke and had regular sleeping schedules seven days before they visited the University clinical research facility. The research team then measured over 130 metabolite rhythms using a targeted metabolomics approach. This metabolite data was then used in a machine learning program to predict circadian timing.

Professor Skene stated, "We are excited but cautious about our new approach to predicting DLMO—as it is more convenient and requires less sampling than the tools currently available. While our approach needs to be validated in different populations, it could pave the way to optimize treatments for circadian rhythm sleep disorders and injury

recovery.

"Smart devices and wearables offer helpful guidance on sleep patterns—but our research opens the way to truly personalized sleep and meal plans, aligned to our personal biology, with the potential to optimize health and reduce the risks of serious illness associated with poor sleep and mistimed eating."

Professor Roelof Hut, co-author of the study from University of Groningen, said, "Our results could help to develop an affordable way to estimate our own circadian rhythms that will optimize the timing of behaviors, diagnostic sampling, and treatment."

More information: Woelders, Tom et al, Machine learning estimation of human body time using metabolomic profiling, *Proceedings of the National Academy of Sciences* (2023). DOI: 10.1073/pnas.2212685120

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