Wearable tracker study links insufficient sleep to biological aging and cardiovascular disease risk

November 11 2019

Getting a good night's sleep is important, and insufficient sleep has been linked to poor health in many studies. Analysing data collected from wearable trackers, researchers from the SingHealth Duke-NUS Institute of Precision Medicine (PRISM) and the National Heart Centre Singapore (NHCS) recently demonstrated that chronic sleep deprivation is associated with increased cardiovascular disease risk markers and accelerated biological aging. Their findings have been published in the journal *Communications Biology*.

In a bid to examine if the amount and quality of sleep one gets every day is linked to one's health and risk of disease, the PRISM-NHCS team analysed the sleep patterns of Singaporeans through data collected from wearable technology. More than 480 healthy volunteers donned Fitbit trackers and submitted one week's sleep data for the study. In addition to sleep data, the team collected detailed lifestyle information and data for cardiovascular disease risk factors such as blood pressure, cholesterol, blood glucose. Whole-genome sequencing and cardiac images of each individual volunteer were also analysed.

To estimate biological age, co-lead of the study, Assistant Prof Lim Weng Khong, Chief Information Officer, SingHealth Duke-NUS PRISM and Assistant Professor, Cancer and Stem Cell Biology Programme, Duke NUS analysed the volunteers' whole-genome data to estimate their telomere lengths. Telomeres are compound structures of

DNA at the end of the chromosomes in human cells that decline in length as one ages. As a marker of cellular age, telomeres are thought to represent one's biological age, as opposed to chronological age.

They can be affected by external factors such as diet, exercise and lifestyle. Studies have also linked short telomere length to adverse health outcomes including increased cardiovascular disease risk. The team found that the seven percent of volunteers who slept less than five hours a night were twice as likely to have shortened telomeres compared to those who exceeded the recommended sleep amount of seven hours. They also had increased cardiovascular risk factors such as higher body mass indexes and waist circumferences.

"With whole-genome sequencing, additional experiments were not required to infer the biological age of our volunteers. This demonstrates the versatility of genome sequencing and its potential to enrich population health studies. What we found was that volunteers with enough sleep tended to have longer telomeres compared to those that did not. This was even after accounting for other factors such as age and gender, and provides evidence for a link between chronic sleep deprivation and premature aging," said Assistant Prof Lim.

On the use of consumer-grade wearable technology for research, senior author Professor Patrick Tan, Director, SingHealth Duke-NUS PRISM and Professor, Cancer and Stem Cell Biology Programme, Duke-NUS Medical School said, "Consumer wearables have the capacity to capture a lot of data from individuals in their day-to-day life without being intrusive.

Researchers can leverage wearables to obtain precise data such as sleep patterns more efficiently and can analyse large sets of data at one time. The growing adoption of wearables in Singapore means that more volunteers can contribute data from their own devices, providing further

insights into health and disease."

Professor Michael Chee, Professor, Neuroscience and Behavioural Disorders programme, and Principal Investigator, Centre for Cognitive Neuroscience at the Duke-NUS, who was not involved in the study, commented that the findings are a reminder for Singaporeans to adopt better sleep habits. "East Asians as a group are the most sleep deprived people in the world.

This research shows that this comes at the price of increased levels of an ageing marker. It is time to get serious about sleep," he said. Prof Chee is known for his research into sleep deprivation, and has conducted many local sleep studies. The research using wearables is part of the bigger SingHEART study that investigates how lifestyle and genetic factors of Singaporeans can impact disease development. "The fusion of different data types—lifestyle, genetic and clinical, can provide meaningful insights on how our health is shaped. We are grateful to the SingHEART volunteers, who come from all walks of life, for their generosity in taking part and contributing to our research," said Associate Professor Yeo Khung Keong, senior consultant, Department of Cardiology, NHCS who leads the SingHEART Study.

Provided by SingHealth Duke-NUS Institute of Precision Medicine