

ScienceTalk

# Will a sleep tracker help you sleep better?

Over 100 million wearable fitness trackers were sold in 2022. The Covid-19 pandemic helped many experience the benefits of longer sleep, encouraging the enlightened to pursue ‘better sleep’. But how accurate are trackers, what can they tell us that we don’t already know, and how can we benefit from them?

## Michael Chee

With World Sleep Day this Friday, messages about the importance of sleep are likely to be replayed. Statistics about how sleep deprived Singaporeans are, the potential harm to our health caused by chronic poor sleep and a slew of “quick fixes” or “smart hacks” are being revisited.

There will be reminders of the importance of detecting obstructive sleep apnea (when a person experiences repeated blockage to breathing during sleep). What about people who have heard all of these and want to further improve their sleep?

Well over 100 million wearable fitness trackers were sold in 2022 and sales are projected to grow at a compound rate of at least 7 per cent a year for the next five years. The Asia-Pacific region is expected to show the highest rate of uptake in users of such devices. One reason for this is that the Covid-19 pandemic helped many to experience the benefits of longer sleep, encouraging the enlightened to pursue “better sleep”.

What constitutes better sleep involves more than sleeping enough hours. Sleep timing, its efficiency – how much of the time spent in bed that one is actually asleep, regularity, how refreshed one feels when waking and the level of alertness during the day

all matter.

A sleep tracker can measure sleep duration, timing and efficiency, and keep tabs on regularity over time, keeping a record for future reference. Many devices are linked to apps that pronounce a single “sleep score” that collapses the nature of sleep into a single number that is often combined with a summary of physical activity to generate a “wellness” score.

But how accurate are sleep trackers, and what can they tell us that we don’t already know about our sleep? Most importantly: how can we benefit from them?

### HOW ACCURATE ARE TRACKERS?

The reference tool for measuring sleep, polysomnography (PSG), assesses sleep and its depth by measuring electrical signals from the brain and muscles. In its original form, PSG is not feasible in consumer settings. Wearable consumer sleep trackers measure non-electrical indicators of sleep: limb motion, heart rate variability, a circadian factor and skin temperature, roughly in that order of priority. These trade specificity for portability and use miniature sensors and electronics placed either around the wrist or a finger.

The most basic trackers sense only motion. Increasing the number of sensors can improve their use, but only if the information gathered is properly

integrated. Notably, manufacturers differ in how much they invest in training and testing their algorithms.

Age, sex and health can all affect sleep measurement even under ideal conditions, but few manufacturers have had their devices properly assessed. A slick user interface and eye-catching data dashboard attract early sales, but they cannot hide deficiencies in how sleep is evaluated.

For those who are serious about sleep tracking, it is preferable to purchase from manufacturers with proprietary algorithms and hardware which have been scientifically tested.

Averaged across many nights, a healthy person can trust the sleep duration, timing and efficiency readouts of the more dependable brands. However, as algorithms have been trained on mostly young healthy adults under ideal laboratory conditions, inaccurate readouts can occur when a person lies awake while still in bed, watching screens or listening to music.

This can lead to an overestimation of sleep time. As sleep efficiency refers to the ratio of time asleep to time set aside to sleep, wearables may underestimate this metric.

### SLEEP DURATION

Most trackers provide an adequate evaluation of total sleep time. Multiple studies agree that the optimal, average self-reported sleep time for working adults is around seven hours. Critically, time asleep (total sleep time) is about 87 per cent of time spent in bed with the intention to sleep. The latter is what most people understand by the term “sleep duration”. So one should not be excessively concerned if the sleep tracker states that you have slept “only slightly above six hours”.

Sleep duration is normally distributed, akin to height and IQ scores among a population. As

such, an individual’s optimum sleep duration may differ slightly from the average.

Some individuals can remain perfectly healthy sleeping five hours a night, but they are rare, just as few can do 30 chin-ups or run 100m in 10 seconds. If you feel rested after waking and can stay alert without dozing off through the day, you probably had enough sleep the night before.

Sleep tracking provides a means of determining what works for you, keeping in mind that the optimum sleep duration might shift depending on life circumstances and demands.

### DEEP (SLOW WAVE) SLEEP AND R.E.M. SLEEP

Sleep scientists have written much about how sleep architecture influences learning and memory, mental health, and well-being. Slow wave sleep (N3), which dominates the first half of the night’s sleep, is restorative for the brain and body, which is why it gets attention.

Although it declines with age, it is highly conserved in younger people. As a result, even when younger people sleep less, it is possible to obtain as much N3 with as little as 5½ hours of sleep

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as that if one had seven or more hours. REM, which appears more in the second half of a night’s sleep, can be affected by alcohol intake, smoking and medication.

Many consumer sleep devices display the length of your night’s N3 and REM sleep on their dashboard. But most trackers do not currently measure sleep stages accurately enough for clinical decision-making, as visually appealing as these displays are.

Even with accurate data, modifying how our sleep develops is not straightforward, and the benefits are unclear. Raised awareness that sleep architecture contributes to cognitive performance, health and well-being is helpful, but one should not lose sleep over these numbers or get into a competition with friends about how much N3 or REM one has.

### SLEEP TIMING AND REGULARITY

Unlike duration, there is less information on sleep timing and regularity. Sleeping late (past midnight is a rough guide) or irregular sleep (when how long you sleep varies more than an hour across the week) can be detrimental to health. These can “misalign” the various body clocks which control food metabolism, brain cellular waste clearance, muscle repair and immune functions.

Most devices chart sleep timing and duration over a long interval so anyone can now obtain objective data about their long-term sleep pattern. Balance is vital. It is good to aspire to maintain sleep timing to within an hour’s variation. However, one can probably tolerate a night or two of poor sleep a week without long-term consequences, so it is important to avoid obsessing over keeping a perfect score.

### SLEEP STATE MISPERCEPTION

On some nights, we may think we

did not fall asleep, yet the sleep tracker shows otherwise. This can result from lying still but awake, but at some other times, one may really have been asleep without remembering it.

This phenomenon often happens in the first half of the night and can take place after the first cycle of N3; hence the label “state misperception”. If this happens occasionally, one need not worry, but as subjective perception of sleep quality is itself a risk predictor, one should seek help if this experience is frequent or persistent.

### OTHER FACTORS

Drinking alcohol can cause drowsiness and facilitate sleep initiation. However, drinking before sleeping can interfere with sleep maintenance – being able to stay asleep.

Contrary to popular advice, moderate exercising before bedtime is often permissible. A tracker can provide objective support for what one should do. Similarly, meals high in sugar can affect sleep initiation but the effect may vary across persons. In trackers that detect naps, you can determine what your optimum nap duration is.

A validated sleep tracker is not a shiny toy; it can serve as a wonderful tool to enhance performance and well-being. The wealth of information collected about one’s sleep over long periods can be harnessed to optimise our sleep so that we improve the time we spend awake.

• Michael Chee is professor and director of the Centre for Sleep and Cognition, Yong Loo Lin School of Medicine at the National University of Singapore. He has made many scientific contributions towards understanding our need for sleep, and is on a mission to improve human health, cognition and well-being through paying attention to good sleep.