SLEEP & STRESS

Your Sleep Tracker Is Not the Final Word

Sleep data can reveal patterns, but its apparent precision may hide uncertainty, normal variation and problems that require proper assessment.

The morning verdict

You wake feeling reasonably restored. Then your tracker delivers the bad news: too little deep sleep, several awakenings, a disappointing score. Within seconds, a night that felt acceptable has become evidence that you slept badly. The device has not only recorded your night. It has changed the story you tell yourself about it.

That story matters because sleep is more than a total measured in hours. Your brain cycles through non-rapid eye movement (non-REM) and rapid eye movement (REM) sleep, and repeated interruptions may reduce time in particular stages. Poor-quality sleep can affect thinking, mental and physical health, and ordinary daytime functioning. Most adults need roughly seven to nine hours, but individual needs vary with age, health, lifestyle and sleep patterns.

A tracker can therefore be useful when it helps you notice a pattern. It becomes less useful when its number is treated as a clinical judgment. A sleep study records brain-wave activity, eye movements, breathing, blood pressure, heart rate, and electrical activity in the heart and other muscles. The consumer device beside you, on you or around you should not automatically be assumed to offer the same assessment.

The central mistake is not collecting data. It is giving every piece of data more authority than it has earned. A score can be tidy while your sleep is complicated. It can also draw your attention away from the most consequential evidence available each morning: whether you feel restored and can function through the day.

Not all trackers measure alike

"Wearable" covers devices with very different capabilities. A 2024 systematic review examined 60 papers involving 34 electroencephalography (EEG)-based wearables. EEG records the brain's electrical activity, which is directly relevant to identifying sleep stages. Across 42 validation studies, these devices showed consistently high accuracy in sleep-stage detection, and feasibility studies reported good tolerance, compliance and success rates.

That is encouraging, but it is not permission to assume that every sleep tracker is equally accurate. The review concerned EEG-based devices, not every product that produces a sleep score. It also found that devices varied in features, price, comfort and ease of use. The evidence supports a promising category of measurement, not a blanket endorsement of anything sold as a sleep monitor.

Even the reference standard has practical limits. Polysomnography (PSG), the overnight sleep study used as the benchmark, is burdensome for the person being tested and labour-intensive to conduct. It is also expensive and time-consuming. Those drawbacks help explain the appeal of at-home monitoring, but convenience and clinical equivalence are different questions.

So the first thing a tracker may get wrong is implied certainty. A polished display can make an estimate look settled. Yet the strength of the measurement depends on what the device records, the population in which it was validated and the particular outcome it is trying to identify. "Accurate" is incomplete unless you know: accurate at what?

A tracker is at its best as a witness with limited vision.

Your night is not one number

Sleep quality is partly an experience. You know whether you lay awake worrying, woke unrefreshed or struggled to concentrate the next day. Those details are not merely soft alternatives to objective data. They address aspects of sleep that a physiological measurement and a single nightly score may not capture in the same way.

A 2021 review of 49 studies examined questionnaires used to measure sleep quality, insomnia and daytime sleepiness. Overall, the tools had good psychometric properties, including internal consistency and test-retest reliability. But even widely used questionnaires had unsettled factor structures or uncertain cut-off values, making it harder to draw a clean line between "good" and "poor" sleepers.

The lesson is not that your perception is right and the tracker is wrong. It is that neither should be squeezed into a verdict it cannot support. Research on trazodone makes the mismatch unusually clear. A 2024 meta-analysis of 44 randomised controlled trials found no significant change in participants' perceived total sleep time, although objective total sleep time measured with PSG increased. Perceived sleep quality and several measures of continuity improved, while adverse effects were more common.

Objective and subjective sleep can answer different questions. A device may detect changes you did not notice; you may experience a difficult night that its summary does not represent well. When the two disagree, the disagreement is information. It is not proof that you failed at

sleep-or that your own experience should be overruled.

Normal change can look alarming

A tracker can also mistake difference for danger, especially when a result is compared with an unexplained ideal. Sleep changes with age. A 2020 meta-analysis brought together 169 studies and 5,273 healthy adults who underwent laboratory PSG, producing reference values adjusted for age and sex.

For every decade of age, total sleep time was about 10 minutes shorter, sleep efficiency fell by about two percentage points, and time awake after first falling asleep rose by almost 10 minutes. Sleep-onset time and the number of arousals also increased. These were patterns among healthy adults, not automatic evidence of disease.

This does not mean every worsening number should be dismissed as ageing. It means the number requires context. Your age matters. So do your sleep pattern and daytime functioning. Shift work, jet lag and irregular schedules can put sleep and wakefulness out of step with the local day, while some circadian rhythm disorders cause persistent difficulty sleeping or waking at needed times.

The tracker's cleanest error may therefore be comparison without context. A nightly score can encourage you to chase an abstract version of perfect sleep, even though healthy laboratory measurements vary with age and sex. One result cannot tell you whether a change is ordinary, temporary or medically important.

A signal is not a diagnosis

This distinction becomes critical when a tracker raises the possibility of sleep apnea. Sleep apnea involves repeated episodes in which breathing stops or decreases during sleep. A 2024 systematic review and meta-analysis of 38 studies found that wearable artificial intelligence (AI) showed potential for detecting it, but performance varied by the outcome, algorithm, data, apnea type and device placement.

For detecting sleep apnea, the pooled sensitivity was 0.938 and specificity was 0.752. In practical terms, the technology was better at finding possible cases than at confidently excluding people who did not have the condition. Accuracy for identifying severity level was 0.651. The reviewers concluded that performance remained suboptimal for routine clinical use and recommended using wearables alongside traditional assessment.

A tracker alert can therefore be a prompt, not a diagnosis. Equally, a reassuring result should

not silence a concerning pattern. Loud snoring, snorting, gasping, choking sounds or observed pauses in breathing belong in a conversation with a healthcare provider. So do regular difficulty falling asleep, repeated waking with trouble returning to sleep, or frequent daytime sleepiness.

Clinical assessment may include your medical and sleep history, a physical examination and a sleep study. Chronic insomnia is not simply a run of low scores: it involves persistent trouble falling asleep, staying asleep or getting good-quality sleep despite having the time and environment to sleep. It can interfere with memory, concentration and daily activity.

Bring the pattern, not the score

On Monday, put a plain notebook and pen beside the bed. For the next week, write down your sleep habits and how you functioned the following day. Note the tracker result if you want, but place it beside your own account rather than above it. A sleep diary is one of the tools a healthcare provider may ask you to keep when assessing insomnia.

Record the pattern that would otherwise disappear into a monthly average: difficulty falling asleep, repeated waking, waking too early, feeling unrefreshed or struggling with daytime sleepiness. If another person has noticed loud snoring, gasping, choking sounds or pauses in breathing, write that down too. Those observations are more useful in a medical conversation than a score without context.

Do not use the week to force the numbers upward or to grade each morning. Use it to see whether the tracker agrees with your experience, contradicts it consistently or highlights a change worth discussing. The point is not to prove the device wrong. It is to stop one estimate from becoming the whole account of your sleep.

A tracker is at its best as a witness with limited vision. Your notebook gives it company: your own experience, repeated patterns and the effect on your day. If the pattern is persistent, disruptive or includes breathing warnings, take those notes to a healthcare provider. Bring the tracker data as supporting material-not as the verdict.

Where this comes from

- Sleep Disorders

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- Insomnia

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