



SLEEP TRACKER TECHNOLOGY

- **Many of these new devices and applications have not undergone scientific evaluation**
- **A single night is not always a very accurate reflection of your general sleep**
- **If you had a sleep disorder, tracking sleep with one of these monitors might give you false reassurance**
- **If you think you have a sleep problem, regardless of what the sleep tracker data is telling you, talk to your GP**

Note: All words that are underlined relate to topics in the Sleep Health Foundation Information Library at www.sleephealthfoundation.org.au

High tech wrist watches and smartphone apps have been developed to help monitor your sleep patterns. These trackers promise a lot, with some even claiming to measure the time you spend in each stage of sleep. Although it might be fun to pore over data you have collected about yourself, it is important to keep the pros and cons in mind when using these new sleep tracker technologies.

1. How do sleep trackers monitor sleep?

Most sleep tracker apps and watches use an accelerometer, a device built into most smartphones that senses movement. This device measures how much movement you make during your sleep and this data is then used in an 'algorithm' to estimate sleep time and quality. How sensitive each device is to movement and the algorithm used varies between products. This can greatly affect their accuracy.

Popular trackers, such as the *Fitbit One*, include a sleep mode that aims to provide sleep time and restlessness.

Some wrist sleep trackers claim to also estimate sleep stages - the *Jawbone UP* breaks down sleep time into deep and light stages. The new *Jawbone UP3* has added sensors for measuring skin and room temperature to help indicate deep and REM sleep. The *Basis B1* estimates REM sleep in addition to deep and light sleep stages by measuring heart rate.

Sleep trackers that only use an accelerometer (such as smartphone apps) cannot accurately measure sleep stages. That's because an accelerometer only monitors movement, and there is little difference in movement between the sleep stages. You move a similar amount in deep sleep and lighter stages of sleep.

While most trackers can estimate fairly well when a person is awake versus asleep, they are prone to error. For example, you could be lying still but be awake. In the case of the phone apps *Sleep Cycle* or *Sleep As AnDroid* (which sit on the bed next to you), your bed partner, child or even your dog could impact the amount of movement and noise detected by the device, changing the sleep data.

2. How do these new technologies compare with the gold standard sleep test using brain waves?

Research on some of these sleep trackers suggests that they provide a general estimate of sleep but that they can give misleading information. A 2012 study data with adults who wore an older version of the *Fitbit* tracker found that it overestimated sleep time by an average of 67 minutes (see reference 1).



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Another study in 2014 found the opposite effect in children. The *Fitbit One* underestimated the children's sleep by 105 minutes (see reference 2).

3. Can sleep trackers really measure sleep stages?

Users should not expect these devices to distinguish between sleep stages. This is because they rely on movements, whereas sleep stages are defined by brain wave activity and other body indicators (eye movements and muscle tension) measured in a laboratory sleep test.

The *Basis B1* is one of the few trackers on the market that says it can track REM sleep in addition to light and deep sleep. The device claims it can do this because it includes a heart rate monitor in addition to an accelerometer. However the research on which this claim is based has not been published as yet and so cannot be properly assessed.

4. What are the potential dangers?

For most people, using a monitor to track sleep isn't going to be a problem. In fact, it might help some people understand and review their sleep and wake patterns, and this may ultimately improve their sleep. For example, noticing a pattern of repeatedly going to bed late and sleeping less than required may help the user adjust their sleep habits to allow for longer sleep.

However, if you have a sleep disorder, tracking sleep with one of these monitors might give you some false reassurance. It could also create more anxiety about not getting 'enough' sleep and lead to more difficulty sleeping.

Also, most sleep trackers cannot provide much insight into the quality of sleep. For instance, a person with Sleep Apnea may stop breathing many times a night, but this wouldn't necessarily be detected by a sleep tracker. Their sleep might be very fragmented but they could have remained relatively still in bed for eight hours, resulting in little movement. The sleep tracker data would therefore not accurately reflect this poor quality sleep.

In general the sleep tracker apps and devices will give you a good overview of how long you sleep but they can only tell you so much. You have to use the data to figure out what's working for you and what isn't. If you think there is a problem, regardless of what the sleep tracker data is telling you, talk to your GP.

5. What are the potential benefits?

These devices raise awareness of sleep health and sleep issues. Over time they could show if you are getting less or more disturbed sleep that you might expect. This might lead you to seek treatment or change lifestyle habits. See Understanding and Helping Poor Sleep as a good starting point.

6. Things to remember

- These are consumer products and most have not undergone scientific evaluation. Don't put too much trust in these devices to accurately monitor sleep.
- A single night is not always a very accurate reflection of your general sleep; one night's "data" shouldn't be cause for alarm. If you tend to worry about your sleep then it might be best for you to avoid sleep trackers, or only look at the data occasionally.
- Have fun! Collecting data about yourself can be very interesting. But just remember that sleep trackers tend to point to general trends in your sleep. The specifics need more sophisticated assessment.

References

- (1) Montgomery-Downs, H. E., Insana, S. P., & Bond, J. A. (2012). Movement toward a novel activity monitoring device. *Sleep and Breathing*, 16(3), 913-917.
- (2) Meltzer, L. J., Avis, K. T., Valentin, J., Ambler, D. (2014). Comparison of a Commercial Accelerometer with Polysomnography and Actigraphy in Children and Adolescents. *Sleep*, 37 (abstract supplement), A312.

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Sleep Health Foundation

114/30 Campbell Street, Blacktown NSW 2148
T: +61 (0) 2 8814 8655 F: +61 (0) 2 9672 3884



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