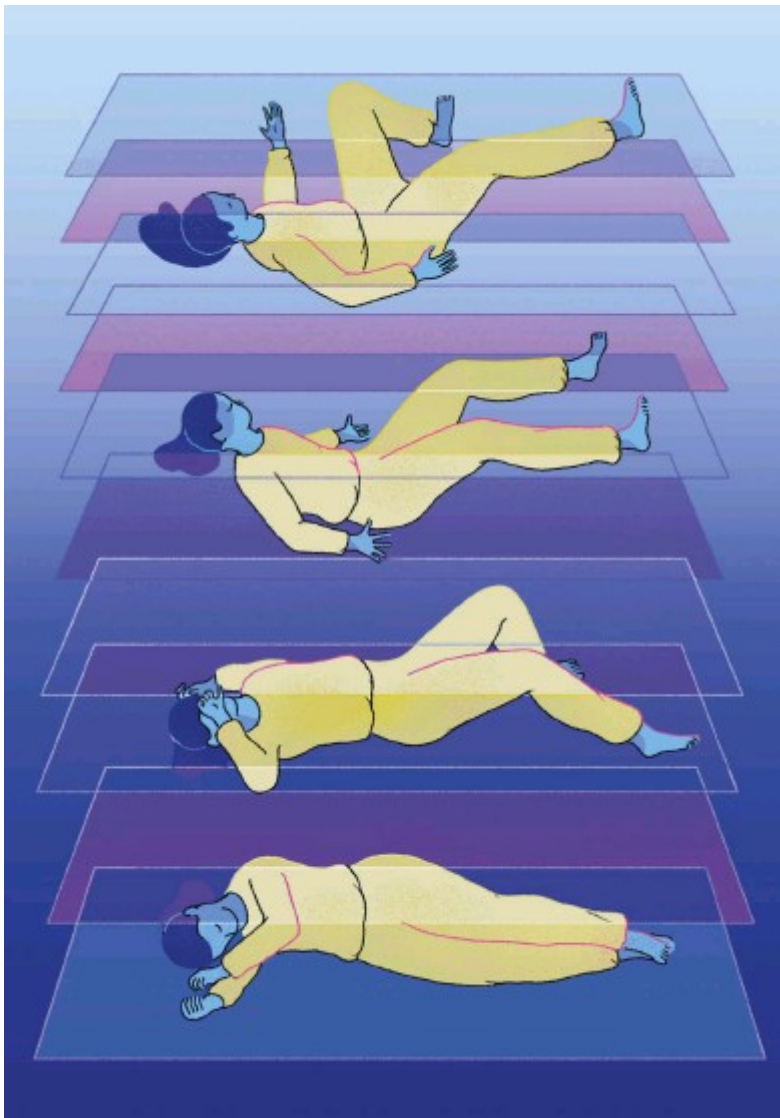


- Sleep**WHILE YOU ARE AT REST, THE MAGIC HAPPENS****Your brain is fully 'on,' solving problems, honing memories and dreaming**

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Any sleep tracker will show you that slumber is far from a passive affair. And no stage of sleep demonstrates that better than rapid eye movement, or REM, commonly called dream sleep. "It's also called paradoxical sleep or active sleep, because REM sleep is actually very close to being awake," said Dr Rajkumar Dasgupta, a sleep medicine and pulmonary specialist at the Keck School of Medicine of the University of Southern California.



Before scientists discovered REM sleep in the 1950s, it wasn't clear that much of anything was happening in the brain at night. Researchers today, however, understand sleep as a highly active process composed of very different types of rest — including REM, which in some ways doesn't seem like rest at all.

While the body typically remains "off" during REM sleep, the brain is very much "on." It's generating vivid dreams, as well as synthesising memories and knowledge. Scientists are still working to unravel exactly how this strange state of consciousness works.

“It is fair to say that there is a lot left to learn about REM sleep,” Dasgupta said. But from what researchers do understand, REM is critical to our emotional health and brain function — and potentially even our longevity.

Where does REM sleep fall in the sleep cycle?

Throughout the night, “we’re going in and out of this rhythmic, symphonic pattern of the various stages of sleep: non-rem 1, 2, 3 and REM,” said Rebecca Robbins, an instructor in medicine at Harvard Medical School and an associate scientist in the division of sleep and circadian disorders at Brigham and Women’s Hospital.

As you doze off, you enter the first stage of nonrem. This lasts less than 10 minutes and is considered a light sleep. Your breathing and heart rate decelerate and your muscles relax as you slip into the second stage of non-rem sleep, where your body temperature drops and your brain waves get slower. Then you enter the third stage, known as deep sleep, when your body repairs your bones and muscles, strengthens your immune system, releases hormones and restores your energy.

After that, REM sleep begins, and your heart rate, breathing and brain activity all increase. Brain regions involved in processing emotions and sensory input (from your dream world) light up. Meanwhile, your brain paralyzes the muscles in your arms and legs, preventing Waking up and going to bed at the same time every day helps your brain and body know when they should be resting, making sleep more efficient.

Rebecca Robbins, an instructor in medicine at Harvard Medical School you from acting out your dreams, Dasgupta explained.

Ideally, you move through the four stages in 90 to 110-minute cycles that repeat four to six times in a typical night. Then, after your last REM cycle, you wake up rested and alert, said Dr. Indira Gurubhagavatula, a sleep specialist at Penn Medicine and associate professor of medicine at the VA Medical Center in Philadelphia.

What are the benefits of REM sleep?

If you’ve ever gone to bed upset about something and woken up noticeably less bothered, it’s likely a result of the emotional processing and memory reconsolidation that happen during REM. There’s evidence that your brain divorces memories from their emotional charge — removing the “sharp, painful edges” from life’s difficulties, said Matthew Walker, a professor of neuroscience and psychology and the founder and director of the Centre for Human Sleep Science at the University of California, Berkeley. REM is “like a form of overnight therapy,” he said.

REM also makes us better learners. During this sleep stage, your brain strengthens neural connections formed by the previous day’s experiences and integrates them into existing networks, Robbins said.

Walker added: “We take those new pieces of information and start colliding them with our back catalog of stored information. It’s almost a form of informational alchemy.”

These novel connections also make us more creative, he said. “We wake up with a revised mind-wide web of associations” that helps us solve problems. Researchers in Walker’s lab conducted a small study where people were roused from different stages of sleep and asked

to solve anagram puzzles. They found that subjects awakened from REM sleep solved 32% more anagrams than subjects who were interrupted during non-rem sleep.

Then, of course, there's dreaming: The majority of our vivid dreaming takes place during REM. Some experts suspect that dreams are a mere byproduct of REM sleep — the mental manifestation of neurological work. But others think they might help people process painful experiences, Walker said.

And although most physical processes, like repairing bone and muscle tissues, happen during the nonrem sleep stages, some hormonal changes occur while someone is in REM, Walker said, like the release of testosterone (which peaks at the onset of the first REM cycle).

What happens if you don't get enough REM?

Genetics and other factors can influence the amount of sleep you need, but most adults should aim for seven to nine hours each night, which includes about two hours of REM sleep, Gurubhagavatula said.

In general, you need less sleep as you age, including slightly less REM. But large deficits of REM sleep, no matter your age, can deprive you of its psychological benefits, Dasgupta said. You may have more trouble learning, processing emotional experiences or solving problems.

Unregulated REM sleep is also linked with cognitive and mental health issues, like slower thinking and depression, said Dr. Ana Krieger, medical director of the Center for Sleep Medicine at Weill Cornell Medicine. Too little REM, fragmented REM and REM sleep behaviour disorder — where muscle paralysis fails to happen and people physically act out their dreams, often by kicking or punching — are associated with neurological issues, from mild forgetfulness to dementia and Parkinson's disease.

A 2020 study of more than 4,000 middle-aged and older adults found that each 5% decrease in REM sleep was linked with a 13% greater risk of dying from any cause over the next two decades. Lack of sleep in general is associated with death, but the research suggests that not getting enough REM sleep "is the single strongest factor of all stages," Walker said.

Walker and other experts aren't sure what to make of this relationship between REM sleep and mortality. "I don't think we understand REM sleep well enough yet to definitively say which mechanisms are at play," he said. or, as Gurubhagavatula said, if lack of REM is actually causing death.

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Dr Indira Gurubhagavatula, a sleep specialist

How do you know if you need more?

It is hard to tease apart signs of REM sleep deficiency from signs of overall sleep deprivation, Gurubhagavatula said. If you're sleep-deprived, then you're probably Rem-deprived. Certain behaviours, however, can specifically compromise your REM sleep. "Cutting your sleep short by going to bed late and then using an alarm clock to wake up can put you at

risk for chronic deprivation of REM sleep,” Gurubhagavatula said. That’s because the longest REM periods often happen at the end of the night.

Having an alcoholic drink before bed also “markedly impairs your REM sleep,” Walker said, because the process of metabolizing alcohol produces compounds that affect sleep cycle regulation. What’s more, Gurubhagavatula explained, moderate and heavy drinkers have a higher risk of REM sleep behavior disorder.

Antidepressants can also reduce REM sleep or trigger REM sleep behaviour disorder. And specific conditions — like narcolepsy, obstructive sleep apnea and depression — can elevate your risk of REM abnormalities, Dasgupta said. If you have one of these conditions and are feeling sleep deprived, seek guidance from a sleep specialist. With sleep apnea, for instance, “the minute we initiate therapy, people often get a REM rebound,” Dasgupta said.

Is it possible to prioritise REM sleep?

Although recent research suggests people may get slightly more REM sleep in the winter, it’s a modern myth that you can target one specific stage of sleep for improvement.

“People want to manipulate sleep and have more of this particular stage, but the body doesn’t function like that,” Krieger said. The natural architecture of sleep is not something to tinker with, but to protect.

“The way to get healthy REM sleep is to focus on getting healthy sleep overall, and let your brain do the rest,” Gurubhagavatula said.

Waking up and going to bed at the same time every day helps your brain and body know when they should be resting, making sleep more efficient, Robbins said. Other behaviours that help regulate your biological clock include having a consistent eating schedule and not eating too late, exercising regularly, getting some morning sunlight and avoiding blue light in the evening.

Make sure to follow other sleep hygiene best practices, such as avoiding alcohol and stimulants like caffeine and nicotine (particularly later in the day) and maintaining a sleep environment that is dark, quiet and cool, Gurubhagavatula said. And don’t overlook the importance of a wind-down routine to help you shift from action to a night of rest and recovery — including that bizarrely busy time your brain spends in REM.