

NIH News in Health

A monthly newsletter from the National Institutes of Health, part of the U.S. Department of Health and Human Services

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Sleep On It

How Snoozing Strengthens Memories



When you learn something new, the best way to remember it is to sleep on it. That's because sleeping helps strengthen memories you've formed throughout the day. It also helps to link new memories to earlier ones. You might even come up with creative new ideas while you slumber.

What happens to memories in your brain while you sleep? And how does lack of sleep affect your ability to learn and remember? NIH-funded scientists have been gathering clues about the complex relationship between sleep and memory. Their findings might eventually lead to new approaches to help students learn or help older people hold onto memories as they age.

"We've learned that sleep before learning helps prepare your brain for initial formation of memories," says Dr. Matthew Walker, a sleep scientist at the University of California, Berkeley. "And then, sleep after learning is essential to help save and cement that new information into the architecture of the brain, meaning that you're less likely to forget it."

While you snooze, your brain cycles through different phases of sleep, including light sleep, deep sleep, and rapid eye movement (REM) sleep, when dreaming often occurs. The cycles repeat about every 90 minutes.

The non-REM stages of sleep seem to prime the brain for good learning the next day. If you haven't slept, your ability to learn new things could drop by up to 40%. "You can't pull an all-nighter and still learn effectively," Walker says. Lack of sleep affects a part of the brain called the hippocampus, which is key for making new memories.

You accumulate many memories, moment by moment, while you're awake. Most will be forgotten during the day. "When we first form memories, they're in a very raw and fragile form," says sleep expert Dr. Robert Stickgold of Harvard Medical School.

But when you doze off, "sleep seems to be a privileged time when the brain goes back through recent memories and decides both what to keep and what not to keep," Stickgold explains. "During a night of sleep, some memories are strengthened." Research has shown that memories of certain procedures, like playing a melody on a piano, can actually improve while you sleep.

Memories seem to become more stable in the brain during the deep stages of sleep. After that, REM—the most active stage of sleep—seems to play a role in linking together related memories, sometimes in unexpected ways. That's why a full night of sleep may help with problem-solving. REM sleep also helps you process emotional memories, which can reduce the intensity of emotions.

It's well known that sleep patterns tend to change as we age. Unfortunately, the deep memory-strengthening stages of sleep start to decline in our late 30s. A study by Walker and colleagues found that adults older than 60 had a 70% loss of deep sleep compared to young adults ages 18 to 25. Older adults had a harder time remembering things the next day, and memory impairment was linked to reductions in deep sleep. The researchers are now exploring options for enhancing deep stages of sleep in this older age group.

"While we have limited medical treatments for memory impairment in aging, sleep actually is a potentially treatable target," Walker says. "By restoring sleep, it might be possible to improve memory in older people."

For younger people, especially students, Stickgold offers additional advice. "Realize that the sleep you get the night after you study is at least as important as the sleep you get the night before you study." When it comes to sleep and memory, he says, "you get very little benefit from cutting corners."

Sleeping to Learn

Research suggests these tips may aid students and other learners:

- Get a good night's sleep before learning. Lack of sleep can cut learning ability by up to 40%.
- Get a full night of sleep within 24 hours after learning to strengthen new memories and build connections between different pieces of information.
- Get enough sleep each night—7 to 8 hours for most adults. Memories won't be strengthened with 4 hours or less of nighttime sleep.
- Naps might help or hinder. A 90-minute nap can strengthen memories, but naps late in the day may make it harder to get to sleep at night.