April 2013

# NIH News in Health

National Institutes of Health · Department of Health and Human Services · newsinhealth.nih.gov



## The Benefits of Slumber

### Why You Need a Good Night's Sleep

We have so many demands on our time—jobs, family, errands—not to mention finding some time to relax. To fit everything in, we often sacrifice sleep. But sleep affects both mental and physical health. It's vital to your well-being.

Of course, sleep helps you feel rested each day. But while you're sleeping, your brain and body don't just shut down. Internal organs and processes are hard at work throughout the night.

"Sleep services all aspects of our body in one way or another: molecular, energy balance, as well as intellectual function, alertness and mood," says Dr. Merrill Mitler, a sleep expert and neuroscientist at NIH.

When you're tired, you can't function at your best. Sleep helps you think more clearly, have quicker reflexes and focus better. "The fact is, when we look at well-rested people, they're operating at a different level than people trying to get by on 1 or 2 hours less nightly sleep," says Mitler.

"Loss of sleep impairs your higher levels of reasoning, problem-solving and attention to detail," Mitler explains. Tired people tend to be less productive at work. They're at a much higher risk for traffic accidents. Lack of sleep also influences your mood, which can affect how you interact with others. A sleep deficit over time can even put you at greater risk for developing depression.

But sleep isn't just essential for the brain. "Sleep affects almost every tissue in our bodies," says Dr. Michael Twery, a sleep expert at NIH. "It affects growth and stress **hormones**, our **immune system**, appetite, breathing, blood pressure and **cardiovascular** health."

Research shows that lack of sleep increases the risk for obesity, heart disease and infections. Throughout the night, your heart rate, breathing rate and blood pressure rise and fall, a process that may be important for cardiovascular health. Your body releases hormones during sleep that help repair cells and control the body's use of energy. These hormone changes can affect your body weight.

"Ongoing research shows a lack of sleep can produce diabetic-like conditions in otherwise healthy people," says Mitler.

Recent studies also reveal that sleep can affect the efficiency of vaccinations. Twery described research showing that well-rested people who received the flu vaccine developed stronger protection against the illness.

A good night's sleep consists of 4 to 5 sleep cycles. Each cycle includes periods of deep sleep and rapid eye movement (REM) sleep, when we dream. "As the night goes on, the portion of that cycle that is in REM sleep increases. It turns

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### Definitions

**Hormones**
Molecules sent through the bloodstream to signal another part of the body to grow or react a certain way.

**Immune System**
The system that protects your body from invading viruses, bacteria and other microscopic threats.

**Cardiovascular**
The system of heart and vessels that circulates blood through the body.

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out that this pattern of cycling and progression is critical to the biology of sleep," Twery says.

Although personal needs vary, on average, adults need 7 to 8 hours of sleep per night. Babies typically sleep about 16 hours a day. Young children need at least 10 hours of sleep, while teenagers need at least 9 hours. To attain the maximum restorative benefits of sleep, getting a full night of quality sleep is important, says Twery.

Sleep can be disrupted by many things. Stimulants such as caffeine or certain medications can keep you up. Distractions such as electronics—especially the light from TVs, cell phones, tablets and e-readers—can prevent you from falling asleep.

As people get older, they may not get enough sleep because of illness, medications or sleep disorders. By some estimates, about 70 million Americans of all ages suffer from chronic sleep problems. The 2 most common sleep disorders are insomnia and sleep apnea.

People with insomnia have trouble falling or staying asleep. Anxiety about falling asleep often makes the condition worse. Most of us have occasional insomnia. But chronic insomnia—lasting at least 3 nights per week for more than a month—can trigger serious daytime problems such as exhaustion, irritability and difficulty concentrating.

Common therapies include relaxation and deep-breathing techniques. Sometimes medicine is prescribed. But consult a doctor before trying even over-the-counter sleep pills, as they may leave you feeling unrefreshed in the morning.

People with sleep apnea have a loud, uneven snore (although not everyone who snores has apnea). Breathing repeatedly stops or becomes shallow. If you have apnea, you're not getting enough oxygen, and your brain disturbs your sleep to open your windpipe.

Apnea is dangerous. "There's little air exchange for 10 seconds or more at a time," explains Dr. Phyllis Zee, a sleep apnea expert at Northwestern University. "The oxygen goes down and the body's fight or flight response is activated. Blood pressure spikes, your heart rate fluctuates and the brain wakes you up partially to start your breathing again. This creates stress."

Apnea can leave you feeling tired and moody. You may have trouble thinking clearly. "Also, apnea affects the vessels that lead to the brain so there is a higher risk of stroke associated with it," Zee adds.

If you have mild sleep apnea, you might try sleeping on your side, exercising or losing weight to reduce symptoms. A CPAP machine, which pumps air into your throat to keep your airway open, can also help. Another treatment is a bite plate that moves the lower jaw forward. In some cases, however, people with sleep apnea need surgery.

"If you snore chronically and wake up choking or gasping for air, and feel that you're sleepy during the day, tell your doctor and get evaluated," Zee advises.

NIH is currently funding several studies to gain deeper insights into sleep apnea and other aspects of sleep. One 5-year study of 10,000 pregnant women is designed to gauge the effects of apnea on the mother's and baby's health. Zee says this study will shed more light on apnea and the importance of treatment.

Good sleep is critical to your health. To make each day a safe, productive one, take steps to make sure you regularly get a good night's sleep. ■

## Wise Choices
### Getting Quality Sleep

- Go to bed the same time each night and get up the same time each morning.
- Sleep in a dark, quiet, comfortable environment.
- Exercise daily (but not right before bedtime).
- Limit the use of electronics before bed.
- Relax before bedtime. A warm bath or reading might help.
- Avoid alcohol and stimulants such as caffeine late in the day.
- Avoid nicotine.
- Consult a health care professional if you have ongoing sleep problems.

## Web Links

For more about healthy sleep, click the "Links" tab at:
http://newsinhealth.nih.gov/issue/Apr2013/Feature1

**NIH News in Health** (ISSN 1556-3898)

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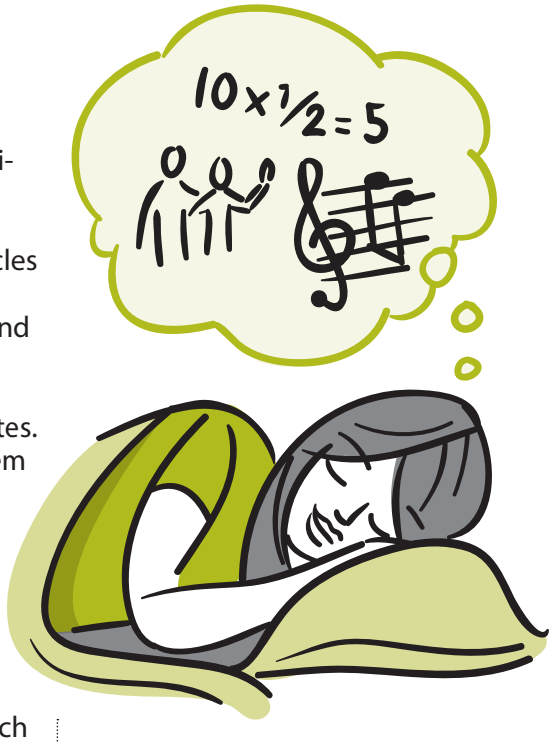
# Sleep On It

## 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." ■

### Wise Choices
### 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.

### Web Links

For more about sleep and memory, click the "Links" tab at:
http://newsinhealth.nih.gov/issue/Apr2013/Feature2

# Health Capsules

For links to more information, see these stories online:
http://newsinhealth.nih.gov/issue/Apr2013/Capsule1

## Brain Scans Give Clues to Antidepressant's Effects

Brain scans during memory tests might help predict which depressed patients will be helped by a fast-acting drug, a new study reports.

Major depression is marked by feelings of sadness, loss, anger or frustration that can interfere with daily life for many weeks. Symptoms can also include memory loss and trouble focusing.

Most depression-fighting drugs must be taken for several weeks before working, which can cause an agonizing wait for patients. Because different people respond to different medications, patients may need to try several drugs over a month or more before getting symptom relief.

Several years ago, NIH researchers discovered that a drug used to treat motion sickness could also rapidly reduce symptoms of depression. But the drug, called scopolamine, didn't work in all patients.

To try to predict the drug's effects, the researchers used MRI to track brain activity in adults with and without major depression. People with major depression are known to have unique patterns of brain activity when asked to pay attention to the emotional content of images. They also tend to remember negative information (such as sadness) better than positive or neutral information.

The researchers found that scopolamine relieved symptoms in 11 of the 15 participants who had major depression. Scopolamine's effectiveness was linked to activity in a specific brain region when patients were asked to remember the emotions on faces that flashed by. Activity in this same brain region was also altered by infusions of scopolamine.

The findings suggest that activity in this brain region might provide early clues about how well scopolamine will work in different patients. Ongoing studies are exploring how the brain's response to emotional images might help guide treatment strategies for major depression. ■

## Living with Low Vision

If you have low vision, then reading, shopping, cooking and writing can seem like a challenge. Even with regular glasses, contact lenses or medicine, you may find everyday tasks difficult. A new booklet and video series from NIH can help people adapt to life with low vision.

Most people with low vision are age 65 or older. The main causes of vision loss in older adults are 4 common eye diseases: age-related macular degeneration, diabetic retinopathy, cataract and glaucoma. In young people, low vision can be caused by inherited eye conditions or trauma.

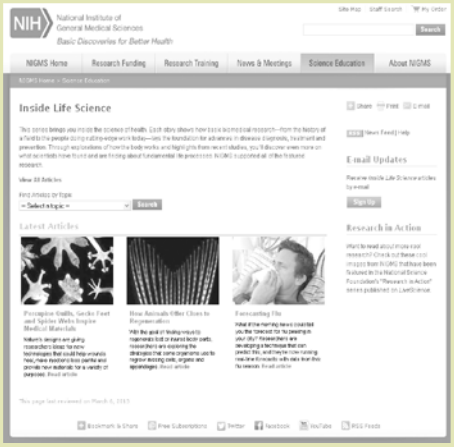
A new 20-page large-print booklet, *Living with Low Vision: What You Should Know*, urges people with low vision to seek help from a low vision specialist. It also provides tips to make the most of your eyesight. The new videos feature patient stories about living with low vision.

The booklet and videos, along with other resources for low vision, can be viewed and downloaded at www.nei.nih.gov/lowvision. ■

### Featured Website
**Inside Life Science**

http://publications.nigms.nih.gov/insidelifescience/

How can porcupine quills help heal wounds? Why can some animals regrow lost body parts? Get answers to these and other intriguing questions related to the science of health. Fun-to-read stories show how basic research lays a foundation for improving health and treating and preventing disease.

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