What Does Sleep Do for You?

A number of aspects of your health and quality of life are linked to sleep, and these aspects are impaired when you are sleep deprived.

Your Learning, Memory, and Mood

Students who have trouble grasping new information or learning new skills are often advised to "sleep on it," and that advice seems well founded. Recent studies reveal that people can learn a task better if they are well rested. They also can better remember what they learned if they get a good night's sleep after learning the task than if they are sleep deprived. Study volunteers had to sleep at least 6 hours to show improvement in learning. Additionally, the amount of improvement was directly related to how much time they slept—for example, volunteers who slept 8 hours outperformed those who slept only 6 or 7 hours. Other studies suggest that it's important to get enough rest the night before a mentally challenging task, rather than only sleeping for a short period or waiting to sleep until after the task is complete.

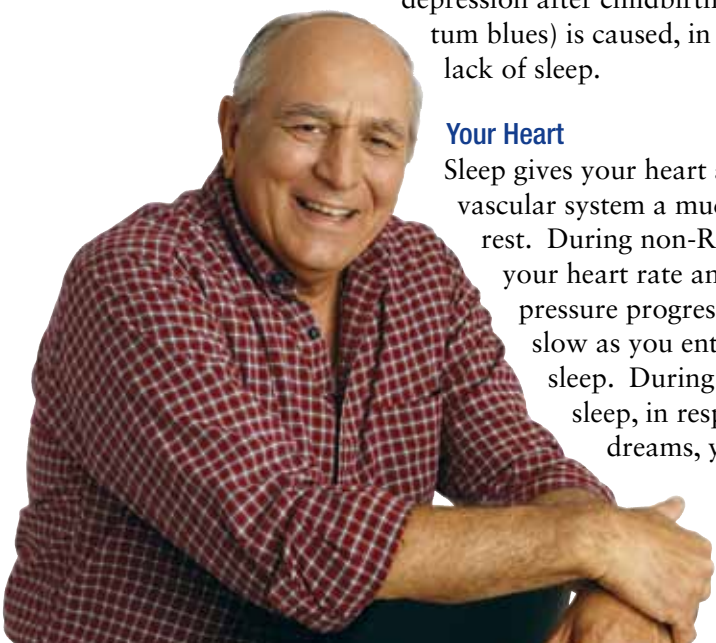
Many well-known artists and scientists claim to have had creative insights while they slept. Mary Shelley, for example, said the idea for her novel *Frankenstein* came to her in a dream. Although it has not been shown that dreaming is the driving force behind innovation, one study suggests that sleep is needed for creative problem-solving. In that study, volunteers were asked to perform a memory task and then were tested on it 8 hours later. Those who were allowed to sleep for 8 hours immediately after trying the task and before being tested were much more likely to find a creative way of simplifying the task and improving their performance, compared with those who were awake the entire 8 hours before being tested.

Exactly what happens during sleep to improve our learning, memory, and insight isn't known. Experts suspect, however, that while

people sleep, they form or strengthen the pathways of brain cells needed to perform these tasks. This process may explain why sleep is needed for proper brain development in infants.

Not only is a good night's sleep required to form new learning and memory pathways in the brain, but also sleep is necessary for those pathways to work well. Several studies show that lack of sleep causes thinking processes to slow down. Lack of sleep also makes it harder to focus and pay attention. Lack of sleep can make you more easily confused. Studies also find that a lack of sleep leads to faulty decisionmaking and more risk taking. A lack of sleep slows down your reaction time, which is particularly important to driving and other tasks that require quick response. When people who lack sleep are tested on a driving simulator, they perform just as poorly as people who are drunk. (See "Crash in Bed, Not on the Road" on page 16.) The bottom line is: Not getting a good night's sleep can be dangerous!

Even if you don't have a mentally or physically challenging day ahead of you, you should still get enough sleep to put yourself in a good mood. Most people report being irritable, if not downright unhappy, when they lack sleep. People who chronically suffer from a lack of sleep, either because they do not spend enough time in bed or because they have an untreated sleep disorder, are at greater risk of developing depression. One group of people who usually don't get enough sleep is mothers of newborns. Some experts think depression after childbirth (postpartum blues) is caused, in part, by a lack of sleep.



Your Heart

Sleep gives your heart and vascular system a much-needed rest. During non-REM sleep, your heart rate and blood pressure progressively slow as you enter deeper sleep. During REM sleep, in response to dreams, your heart

and breathing rates can rise and fall and your blood pressure can be variable. These changes throughout the night in blood pressure and heart and breathing rates seem to promote cardiovascular health.

If you don't get enough sleep, the nightly dip in blood pressure that appears to be important for good cardiovascular health may not occur. Failure to experience the normal dip in blood pressure during sleep can be related to insufficient sleep time, an untreated sleep disorder (for example, sleep apnea), or other factors. Some sleep-related abnormalities may be markers of heart disease and increased risk of stroke.

A lack of sleep also puts your body under stress and may trigger the release of more adrenaline, cortisol, and other stress hormones during the day. These hormones keep your blood pressure from dipping during sleep, which increases your risk for heart disease. Lack of sleep also may trigger your body to produce more of certain proteins thought to play a role in heart disease. For example, some studies find that people who repeatedly don't get enough sleep have higher than normal blood levels of C-reactive protein, a sign of inflammation. High levels of this protein may indicate an increased risk for a condition called atherosclerosis, or hardening of the arteries.

Your Hormones

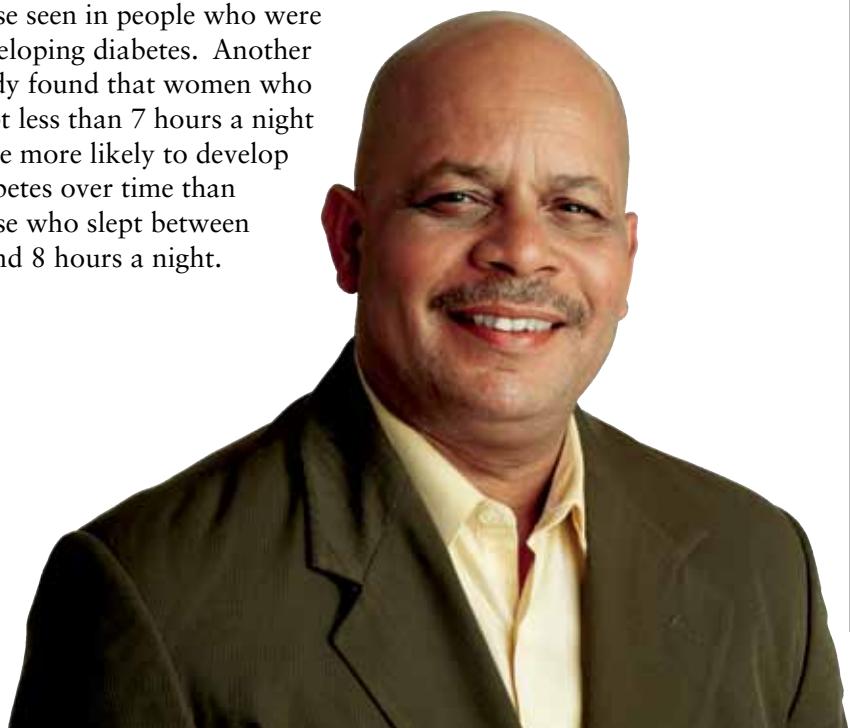
When you were young, your mother may have told you that you need to get enough sleep to grow strong and tall. She may have been right! Deep sleep (stage 3 non-REM sleep) triggers more release of growth hormone, which contributes to growth in children and boosts muscle mass and the repair of cells and tissues in children and adults. Sleep's effect on the release of sex hormones also contributes to puberty and fertility. Consequently, women who work at night and tend to lack sleep may be at increased risk of miscarriage.

Your mother also probably was right if she told you that getting a good night's sleep on a regular basis would help keep you from getting sick and help you get better if you do get sick. During sleep, your body creates more cytokines—cellular hormones that help the immune system fight various infections. Lack of sleep can reduce your body's ability to fight off common infections. Research also reveals that a lack of sleep can reduce the body's response to the flu

vaccine. For example, sleep-deprived volunteers given the flu vaccine produced less than half as many flu antibodies as those who were well rested and given the same vaccine.

Although lack of exercise and other factors also contribute, the current epidemic of diabetes and obesity seems to be related, at least in part, to chronically short or disrupted sleep or not sleeping during the night. Evidence is growing that sleep is a powerful regulator of appetite, energy use, and weight control. During sleep, the body's production of the appetite suppressor *leptin* increases, and the appetite stimulant *grehlin* decreases. Studies find that the less people sleep, the more likely they are to be overweight or obese and prefer eating foods that are higher in calories and carbohydrates. People who report an average total sleep time of 5 hours a night, for example, are much more likely to become obese, compared with people who sleep 7–8 hours a night.

A number of hormones released during sleep also control the body's use of energy. A distinct rise and fall of blood sugar levels during sleep appears to be linked to sleep stages. Not sleeping at the right time, not getting enough sleep overall, or not enough of each stage of sleep disrupts this pattern. One study found that, when healthy young men slept only 4 hours a night for 6 nights in a row, their insulin and blood sugar levels matched those seen in people who were developing diabetes. Another study found that women who slept less than 7 hours a night were more likely to develop diabetes over time than those who slept between 7 and 8 hours a night.



Crash in Bed

Not on the Road

Most people are aware of the hazards of drunk driving. But driving while sleepy can be just as dangerous. Indeed, crashes due to sleepy drivers are as deadly as those due to drivers impaired by alcohol. And you don't have to be asleep at the wheel to put yourself and others in danger. Both alcohol and a lack of sleep limit your ability to react quickly to a suddenly braking car, a sharp curve in the road, or other situations that require rapid responses. Just a few seconds' delay in reaction time can be a life-or-death matter when driving. When people who lack sleep are tested on a driving simulator, they perform as badly as or worse than those who are drunk. The combination of alcohol and lack of sleep can be especially dangerous. There is increasing evidence that sleep deprivation and inexperience behind the wheel, both particularly common in adolescents, is a lethal combination.

Of course, driving is also hazardous if you fall asleep at the wheel, which happens surprisingly often. One-quarter of the drivers surveyed in New York State reported they had fallen asleep at the wheel at some time. Often, people briefly nod off at the wheel without being aware of it—they just can't recall what happened over the previous few seconds or longer. And people who lack sleep are more apt to take risks and make poor judgments, which also can boost their chances of getting in a car crash.

Opening a window or turning up the radio won't help you stay awake while driving. The bottom line is that there is no substitute for sleep. Be aware of these warning signs that you are too sleepy to drive safely: trouble keeping your eyes open or focused, continual yawning, or being unable to recall driving the past few miles. Remember, if you are short on sleep, stay out of the driver's seat!