HANDS-ON Health
Health Wave Newsletter
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Sleep

was long considered just a uniform block of time when you are not awake.

Thanks to sleep studies done over the past several decades, it is now known that sleep has distinct stages that cycle throughout the night in predictable patterns.

How well rested you are and how well you function depend not just on your total sleep time but on how much of the various stages of sleep you get each night.

Without enough sleep, you can't focus and pay attention or respond quickly. A lack of sleep may even cause mood problems. In addition, growing evidence shows that a chronic lack of sleep increases the risk for developing obesity, diabetes, cardiovascular disease, and infections.

Types of Sleep

Sleep is divided into two basic types: **rapid eye movement (REM) sleep** and **non-REM sleep** (with four different stages).

Typically, sleep begins with non-REM sleep. In stage 1 non-REM sleep, you sleep lightly and can be awakened easily by noises or other disturbances. During this first stage of sleep, your eyes move slowly, and your muscle activity slows. You then enter stage 2 non-REM sleep when your eye movements stop. Your brain shows a distinctive pattern of slower brain waves with occasional bursts of rapid waves.

When you progress into stage 3 non-REM sleep, your brain waves become even slower, although they are still punctuated by smaller, faster waves. By stage 4 non-REM sleep, the brain produces extremely slow waves almost exclusively. Stages 3 and 4 are considered deep sleep, during which it is very difficult to be awakened. Deep sleep is considered the "restorative" part of sleep that is necessary for feeling well rested and energetic during the day.

During REM sleep, your eyes move rapidly in various directions, even though your eyelids remain closed. Your breathing also becomes more rapid, irregular, and shallow, and your heart rate and blood pressure increase.

Types of Sleep

NON-REM SLEEP:

Stage 1: light sleep; easily awakened; muscle activity; eye movement slows down.

Stage 2: eye movement stops; slower brain waves with occasional bursts of rapid brain waves.

Stage 3: considered deep sleep; difficult to awaken; brain waves slow down more; but still have occasional rapid waves.

Stage 4: considered deep sleep; difficult to awaken; extremely slow brain waves.

REM SLEEP:

Usually first occurs around 90 minutes after falling asleep; cycles along with the non-REM sleep stages throughout the night; eyes moved rapidly, with eyelids closed. Breathing is more rapid, irregular and shallow. Heart rate and blood pressure increase. Dreaming occurs. Arm and leg muscles are temporarily paralyzed.

The first period of REM sleep you experience usually occurs about an hour to an hour and a half after falling asleep. After that, the sleep stages repeat themselves continuously while you sleep. As the night progresses, REM sleep time becomes longer, while time spent in non-REM sleep stages 3 and 4 becomes shorter. By morning, nearly all your sleep time is spent in stages 1 and 2 of non-REM sleep and in REM sleep. If REM sleep is disrupted during one night, REM sleep time is typically longer than normal in subsequent nights until you catch up. Overall, almost one-half your total sleep time is spent in stages 1 and 2 non-REM sleep and about one-fifth each in deep sleep (stages 3 and 4 of non-REM sleep) and REM sleep. In contrast, infants spend half or more of their total sleep time in REM sleep. Gradually, as they mature, the percentage of total sleep time they spend in REM progressively decreases to reach the one-fifth level typical of later childhood and adulthood.

Technician monitoring volunteers in sleep laboratory

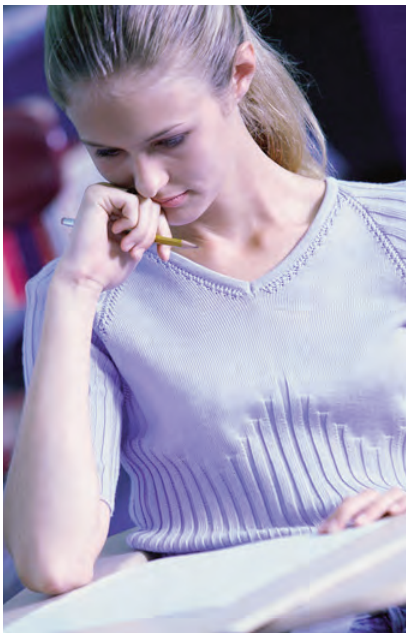
What does sleep do for you?

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

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 remember better what they learned if they get a good night's sleep after learning the task than if they are sleep deprived. Volunteers had to sleep at least 6 hours to show improvement in learning, and the amount of improvement was directly tied to how much time they slept. In other words, volunteers who slept 8 hours outperformed those who slept only 6 or 7 hours.

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 reinforce the pathways of brain cells needed to perform these tasks. This process may explain why sleep is needed for proper brain development in infants.

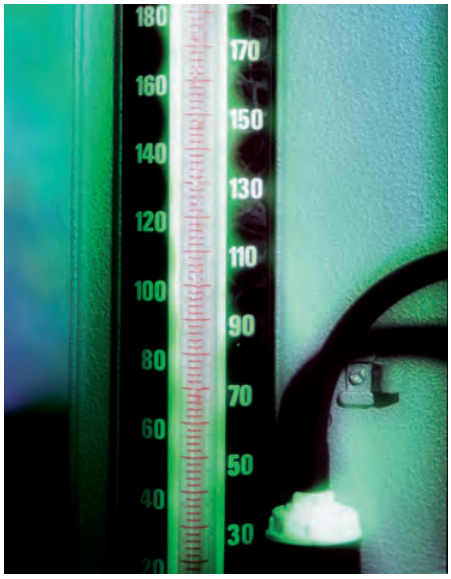


Not only is a good night's sleep required to form new learning and memory pathways in the brain, but sleep is also necessary for those pathways to work up to speed. Several studies show that lack of sleep causes thinking processes to slow down. Lack of sleep also makes it harder to focus and pay attention. Lack of sleep can make you more easily confused. Studies also find a lack of sleep leads to faulty decision-making and more risk taking. A lack of sleep slows down your reaction time, which is particu-

larly significant to driving and other tasks that require quick response. When people who lack sleep are tested by using a driving simulator, they perform just as poorly as people who are drunk. 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.

HEART HEALTH

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, your heart rate and blood pressure have boosted spikes of activity. Overall, however, sleep reduces your heart rate and blood pressure by about 10 percent. If you don't get enough sleep, this nightly dip in blood pressure, which appears to be important for good cardiovascular health, may not occur. According to several studies, if your blood pressure does not dip during sleep, you are more likely to experience strokes, chest pain known as angina, an irregular heartbeat, and heart attacks.



HORMONES

Deep sleep triggers more release of growth hormone, which fuels 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 encourages puberty and fertility.

Getting a good night's sleep on a regular basis also helps keep you from getting sick and helps 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 the 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 are important contributors, the current epidemic of diabetes and obesity appears to be related, at least in part, to chronically getting inadequate sleep. ***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.

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 stage. Not getting enough sleep overall or 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 mimicked 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.

How much sleep is enough?

When healthy adults are given unlimited opportunity to sleep, they sleep on average between 8 and 8.5 hours a night. But sleep needs vary from person to person. Some people appear to need only about 7 hours to avoid problem sleepiness whereas others need 9 or more hours of sleep. Sleep needs also change throughout the lifecycle. Newborns sleep between 16 and 18 hours a day, and children in preschool sleep between 10 and 12 hours a day. School-aged children and adolescents need at least 9 hours of sleep a night.

The hormonal influences of puberty tend to shift adolescents' biological clocks. As a result, teenagers are more likely to go to bed later than younger children and adults, and they tend to want to sleep later in the morning. ***This sleep–wake rhythm is contrary to the early-morning start times of many high schools and helps explain why most teenagers get an average of only 7–7.5 hours of sleep a night.***

As people get older, the pattern of sleep also changes—especially the amount of time spent in the deep sleep stages. Children spend more time than adults in these sleep stages. This explains why children can sleep through loud noises and why they might not wake up when they are moved from the car to their beds. During adolescence, a big drop occurs in the amount of time spent in deep sleep, which is replaced by lighter, stage 2 sleep. Between young adulthood and midlife, the percentage of deep sleep falls again— from less than 20 percent to less than 5 percent, one study suggests— and is replaced with lighter sleep (stages 1 and 2). From midlife through late life, people's sleep has more interruptions by wakefulness during the night. This disruption causes older persons to lose more and more of stages 1 and 2 non-REM sleep as well as REM sleep.

Despite variations in sleep quantity and quality, both related to age and between individuals, studies suggest that the optimal amount of sleep needed to perform adequately, avoid a sleep debt, and not have problem sleepiness during the day is about 7–8 hours for adults and 9 or more hours for school-aged children and adolescents. Similar amounts seem to be necessary to avoid further increasing the risk of developing obesity, diabetes, or cardiovascular disorders.

Quality of sleep is as important as quantity. People whose sleep is frequently interrupted or cut short may not get enough of both non- REM sleep and REM sleep. Both types of sleep appear to be crucial for learning and memory—and perhaps for all the other restorative benefits of healthy sleep, including the growth and repair of cells.

Many people try to make up for lost sleep during the week by sleeping more on the weekends. But if you have lost too much sleep, sleeping in on the weekend does not completely erase your sleep debt.

Certainly, sleeping more at the end of the week does not make up for the hampered performance you most likely had at the beginning of or during that week. Just 1 night of inadequate sleep can adversely affect your functioning and mood during at least the next day.

Top Ten Sleep Myths

Myth 1: Sleep is a time when your body and brain shut down for rest and relaxation.

No evidence shows that any major organ (including the brain) or regulatory system in the body shuts down during sleep. Some physiological processes actually become more active while you sleep. For example, secretion of certain hormones is boosted, and activity of the pathways in the brain needed for learning and memory is heightened.

Myth 2: Getting just 1 hour less sleep per night than needed will not have any effect on your daytime functioning.

This lack of sleep may not make you noticeably sleepy during the day. But even slightly less sleep can affect your ability to think properly and respond quickly, and it can compromise your cardiovascular health and energy balance as well as the ability to fight infections, particularly if lack of sleep continues. If you consistently

do not get enough sleep, eventually a sleep debt builds up that will make you excessively tired during the day.

Myth 3: Your body adjusts quickly to different sleep schedules.

Your biological clock makes you most alert during the daytime and most drowsy at night. Thus, even if you work the night shift, you will naturally feel sleepy when nighttime comes. Most people can reset their biological clock, but only by appropriately timed cues—and even then, by 1–2 hours per day at best.

Myth 4: People need less sleep as they get older.

Older people don't need less sleep, but they often get less sleep or find their sleep less refreshing. That's because as people age, they spend less time in the deep, restful stages of sleep and are more easily awakened. Older people are also more likely to have insomnia or other medical conditions that disrupt their sleep.

Myth 5: Extra sleep at night can cure you of problems with excessive daytime fatigue.

Not only is the quantity of sleep important but also the quality of sleep. Some people sleep 8 or 9 hours a night but don't feel well rested when they wake up because the quality of their sleep is poor. A number of sleep disorders and other medical conditions affect the quality of sleep. Sleeping more won't alleviate the daytime sleepiness these disorders or conditions cause. However, many of these disorders or conditions can be treated effectively with changes in behavior or with medical therapies.

Myth 6: You can make up for lost sleep during the week by sleeping more on the weekends.

Although this sleeping pattern will help relieve part of a sleep debt, it will not completely make up for the lack of sleep. This pattern also will not make up for impaired performance during the week because of not sleeping enough. Furthermore, sleeping later on the weekends can affect your biological clock so that it is much harder to go to sleep at the right time on Sunday nights and get up early on Monday mornings.

Myth 7: Naps are a waste of time.

Although naps do not substitute for a good night's sleep, they can be restorative and help counter some of the impaired performance that results from not getting enough sleep at night. Naps can actually help you learn how to do certain tasks quicker. But avoid taking naps later than 3 p.m., as late naps can interfere with your ability to fall asleep at night.

Myth 8: Snoring is a normal part of sleep.

Snoring during sleep is common, particularly as a person gets older. Evidence is growing that snoring on a regular basis can make you sleepy during the day and more susceptible to diabetes and heart disease. In addition, some studies link frequent snoring to problem behavior and poorer school achievement in children. Loud, frequent snoring can also be a sign of sleep apnea, a serious sleep disorder that should be treated

Myth 9: Children who don't get enough sleep at night will show signs of sleepiness during the day.

Unlike adults, children who don't get enough sleep at night typically become more active than normal during the day. They also show difficulty paying attention and behaving properly.

Myth 10: The main cause of insomnia is worry.

Although worry or stress can cause a short bout of insomnia, a persistent inability to fall asleep or stay asleep at night can be caused by a number of other factors. Certain medications and sleep disorders can keep you up at night. Other common causes of insomnia are depression, anxiety disorders, and asthma, arthritis, or other medical conditions with symptoms that become more troublesome at night.

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TIPS FOR GETTING A GOOD NIGHT'S SLEEP

STICK TO A SLEEP SCHEDULE. Go to bed and wake up the same time each day. As creatures of habit, people have a hard time adjusting to altered sleep patterns. Sleeping later on weekends won't fully make up for the lack of sleep during the week and will make it harder to wake up early on Monday morning.

EXERCISE IS GREAT BUT NOT TOO LATE IN THE DAY. Try to exercise at least 30 minutes on most days but not later than 5 or 6 hours before your bedtime.

AVOID CAFFEINE AND NICOTINE. Coffee, colas, certain teas, and chocolate contain the stimulant caffeine, and its effects can take as long as 8 hours to wear off fully. Therefore, a cup of coffee in the late afternoon can make it hard for you to fall asleep at night.

AVOID ALCOHOLIC DRINKS BEFORE BED. Adults may think having an alcoholic "nightcap" will help them sleep, but alcohol robs them of deep sleep and REM sleep, keeping them in the lighter stages of sleep.

AVOID LARGE MEALS AND BEVERAGES LATE AT NIGHT. A light snack is okay, but a large meal can cause indigestion that interferes with sleep. Drinking too many fluids at night can cause frequent awakenings to urinate.

IF POSSIBLE, AVOID MEDICINES THAT DELAY OR DISRUPT YOUR SLEEP. Some commonly prescribed heart, blood pressure, or asthma medications, as well as some over-the-counter and herbal remedies for coughs, colds, or allergies, can disrupt sleep patterns. If you have trouble sleeping, talk to your doctor or pharmacist to see if any drugs you're taking might be contributing to your insomnia.

DON'T TAKE NAPS AFTER 3 P.M. Naps can help make up for lost sleep, but late afternoon naps can make it harder to fall asleep at night.

RELAX BEFORE BED. Don't overschedule your day so that no time is left for unwinding. A relaxing activity, such as reading or listening to music, should be part of your bedtime ritual.

TAKE A HOT BATH BEFORE BED. The drop in body temperature after getting out of the bath may help you feel sleepy, and the bath can help you relax and slow down so you're more ready to sleep.

HAVE A GOOD SLEEPING ENVIRONMENT. Get rid of anything that might distract you from sleep, such as noises, bright lights, an uncomfortable bed, or warm temperatures. You sleep better if the temperature in your bedroom is kept on the cool side. A TV or computer in the bedroom can be a distraction and deprive you of needed sleep. Having a comfortable mattress and pillow can help promote a good night's sleep.

HAVE THE RIGHT SUNLIGHT EXPOSURE. Daylight is key to regulating daily sleep patterns. Try to get outside in natural sunlight for at least 30 minutes each day. If possible, wake up with the sun or use very bright lights in the morning. Sleep experts recommend that, if you have problems falling asleep, you should get an hour of exposure to morning sunlight.

DON'T LIE IN BED AWAKE. If you find yourself still awake after staying in bed for more than 20 minutes, get up and do some relaxing activity until you feel sleepy. The anxiety of not being able to sleep can make it harder to fall asleep.

SEE A DOCTOR IF YOU CONTINUE TO HAVE TROUBLE SLEEPING. If you consistently find yourself feeling tired or not well rested during the day despite spending enough time in bed at night, you may have a sleep disorder. Your family doctor or a sleep specialist should be able to help you.

Source: http://www.nhlbi.nih.gov