Quality sleep: the center of a healthy life

The essential role of sleep — and what happens when we don’t get enough of it.
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About Sleep Number Corporation
As the leader in sleep innovation, Sleep Number Corporation delivers the best quality sleep through effortless, adjustable comfort and biometric sleep tracking. Sleep Number’s proprietary SleepIQ® technology platform – one of the most comprehensive databases of biometric consumer sleep data – is proving the connection between sleep and wellbeing. With breakthrough innovations such as the revolutionary Sleep Number 360® smart bed, Sleep Number is redefining the future of sleep and shaping the future of health and wellness. To experience better quality sleep, visit one of the over 550 Sleep Number® stores located in all 50 states or SleepNumber.com.
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Introduction

Many of us are tired. Poor or insufficient sleep affects the daily activities of 45 percent of Americans, according to the National Sleep Foundation’s 2014 Sleep Health Index™.1 Forty percent of Americans get less than the seven recommended hours of sleep – an average of 6.8 hours in 2013, according to a Gallup poll, significantly less than the 7.9 hour average in 1942.2

What is sleep deprivation costing us? According to one estimate, we lose $63.2 billion every year in the U.S. from lost productivity due to inadequate sleep.3 On a personal level, sleep affects everything from our physical health to our level of energy, memory, attentiveness, agility, creativity, resourcefulness, relationships with others and much more. Our bodies recover faster and perform better with adequate sleep. We look better, feel better and make better decisions when we are well rested.

The nation’s sleep deficit – both the quantity and quality of sleep – is a serious, unmet health need. Inadequate sleep is a risk factor for obesity and chronic medical conditions such as diabetes, high blood pressure and heart disease, in addition to causing fatigue and lack of focus, according to the Division of Sleep Medicine at Harvard Medical School. Persistent sleep issues also are linked to long-term mood disorders, including depression, anxiety and mental distress.4 Lack of sleep affects the immune system, inflammation, cholesterol, metabolism and the hormones that regulate appetite, according to University of Helsinki researchers.5

While people have come to understand the importance of diet and exercise for good health, the essential role of sleep is often overlooked. People who are doing everything else right but not sleeping well are suffering the cognitive, physical and emotional consequences of inadequate rest. Sleep is at the center of a healthy life, yet many people are not getting enough sleep – and the sleep they are getting is marginal.

The public and the medical community need to better understand and then embrace the importance of sleep, consequences of inadequate sleep and steps for improving sleep naturally.
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The struggle for adequate sleep

Our lives are governed by three clocks:
• Circadian rhythms that guide our internal cycles, including sleep, body temperature, reproduction and digestion;
• Solar clock that signals production of melatonin necessary for sleeping and waking; and
• Our social clock, which is often misaligned with the other two.

Our exposure to sun and artificial light play key roles in our ability to fall asleep and wake up, helping us regulate our 24-hour internal clock. These clocks function best when they operate consistently. Unfortunately, our social clock interferes – especially on weekends – when we shift our sleep habits and put everything out of alignment.

Many of us sleep far less than our ancestors. One reason is artificial light, which allows us to keep going long after the sun goes down. Round-the-clock access to technology is another contributing factor. Seventy years ago, 11 percent of Americans got less than the recommended amount of nightly sleep compared with 40 percent in 2013, according Gallup. On a typical night, up to one third of the U.S. population sleeps poorly, according to the Centers for Disease Control and Prevention (CDC), which links insufficient sleep to motor vehicle crashes, industrial disasters and medical and other occupational errors.

Modern evidence shows us that collectively our sleep patterns leave us little margin for error. During the week after the Daylight Savings Time change, there is a dramatic increase in traffic accidents and an increase in heart attacks.

By the Numbers

In 1942, 84% of U.S. adults got the recommended seven to nine hours of sleep vs. only 59% in 2013.

Source: Gallup 2013
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Sleep myths

Why are we sleeping less? People believe they can learn to function on less sleep. They also think they can make up their sleep deficit by sleeping more on the weekend. Both beliefs are false, but they’re two of the three most common sleep myths:

**Myth 1:**
I can teach my body to function on less sleep.

When you are getting less sleep than your body needs, you lose the ability to tell that you’re impaired (much like the effect of consuming too much alcohol). Even moderate sleep deprivation results in cognitive and motor impairments equivalent to alcohol intoxication, according to a study published in *Occupational and Environmental Medicine.*

**Myth 2:**
I can “catch up” on sleep later.

The sleep deficit you accrue during the week can’t be balanced out by sleeping more on the weekend. There are cumulative, negative health effects from inadequate sleep. Sleeping later on weekends shifts your body’s sleep schedule, making it even harder to get proper sleep the following week.

**Myth 3:**
The amount of sleep is what matters.

Quality of sleep is as important as quantity. Not all sleep is created equal — just as “junk food” fills you with empty calories, “junk sleep” can occupy your night but not perform the restorative sleep functions your body needs. The choices we make during the day, such as what we consume, our activity/stress levels and sleep environment, affect the quality of sleep we get at night.

The good news is that most sleep problems are self-imposed, so with a better understanding of sleep cycles, the importance of sleep and how to get better sleep naturally, everyone can make changes to improve both the quantity and quality of sleep.
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The body recognizes it is tired when it has built up enough sleep debt. Our bodies are designed to balance 16 hours of wakefulness with eight hours of sleep. The pressure to sleep builds all day, though it isn’t linear, so you don’t feel more tired each successive second of the day. The body’s internal clock relies on circadian rhythms to balance the two systems of being asleep and awake. During the day, the body uses chemicals like cortisol and adrenaline and controls body temperature to fight off the need for sleep until nighttime. When it’s time to go to sleep, the body produces melatonin, which instructs the heart rate to drop and body temperature to go down. The release of melatonin is triggered by circadian rhythms at dusk when the light changes. In our lives filled with artificial light, we can help signal to our bodies that it’s time to begin preparing for sleep by using dimmer light with softer, more golden (less blue) tones. Typically, people take 10-20 minutes to fall asleep. Falling asleep instantly as your head hits the pillow or lying awake for hours are both symptomatic of sleep problems.

Falling asleep

The body’s internal clock relies on circadian rhythms to balance the two systems of being asleep and awake.
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Sleep cycles

Each stage of sleep is different and plays a critical role in promoting good health. Sleep stages occur in repetitive cycles throughout the night. The sleep stages graph shows these repeating cycles — and what you’re missing when sleep is cut short. For adults, getting seven to eight hours of sleep is essential for the body’s complete, restorative sleep architecture to occur. The brain activity graphic illustrates the type of brain activity in each stage.

Sleep stages occur in cycles throughout the night.

Sources: American Academy of Sleep Medicine, Division of Sleep Medicine at Harvard Medical School.
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The brain keeps busy when we are sleeping. Each stage of sleep has its own brain activity patterns and plays a distinct role in our physical, mental and emotional health.

Brain patterns during REM sleep are more similar to the awake brain than to light or deep, slow-wave sleep.

Brain activity varies widely during each stage of sleep.

- Awake
- Drowsy
- Stage N1: Transition to sleep
- Stage N2: Light sleep
- Stage N3: Deep, slow-wave sleep
- REM sleep
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Stage N1: beginning to fall asleep

In this stage, the body is falling asleep and begins to experience very light sleep. Brain activity is similar to that of the awake brain.

Sleep cycles (cont.)
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Stage N2: light sleep

This stage of light sleep accounts for 50 percent of the night. The body maintains regular heart rate and breathing while body temperature drops. Though sleep in this stage is light, it is important – it’s not just a placeholder between the cycles of slow wave and REM dream sleep. Stage N2 sleep is key for building motor skills and alertness. The brain establishes neural connections involving muscle memory necessary for learning skills, such as playing an instrument, typing or riding a bike. After a night of sleep, those skills are improved up to 20 percent with no additional practice.11

The brain activity graphic above shows a sleep spindle – a period of activity that binds together the mind/muscle connection needed for complex motor skills.

This stage of sleep also defines the ideal duration for a “power nap” – either 20-25 minutes (before the body enters deep sleep) or 90-100 minutes (after the body has emerged from a cycle of deep sleep). When a person is awakened during one of the stages of deep sleep, it takes a long time to feel alert, posing a problem for first responders, surgeons on call and others who are pulled out of deep sleep and expected to perform.
Stage N3: deep sleep

During these stages of deep sleep, called slow-wave, delta sleep, the brain slows and goes “offline” while the body is restored. Blood pressure drops, breathing slows, muscles relax and the blood supply to the muscles increases. Hormones are released – including 80 percent of the body’s daily allocation of the human growth hormone – helping to restore and repair the body. This phase is critical for the health of the body’s immune function, alertness, tissue growth and recovery from workouts and injuries.
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REM sleep

During REM, dream-state sleep, the brain fires up again and is even more active than when awake (see brain activity graphic above). The body will respond to stimulus from the environment during REM sleep. This stage includes the highest level of neural activity as information is relocated from short-term to long-term memory. Repeating key information throughout the day indicates to the brain that this priority information should be preserved. During REM sleep, the brain is building creativity, complex learning, problem solving and executive functions, including intuition, insight, spatial orientation and perceptual skills. Sufficient amounts of REM sleep can be the difference between being in a good mood or a bad mood and making good decisions versus bad decisions the next day. New research also indicates that REM sleep preserves and crystallizes factual memory while eventually stripping away emotional memory over time, helping people heal from traumatic events. People who regularly try to function on six hours of sleep or less per night are significantly limiting the brain’s ability to develop important cognitive and emotional connections.
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Benefits of sufficient, high-quality sleep

People who get enough quality sleep have more energy, better cognitive function, healthier immune systems, and improved memory, alertness, attentiveness and performance throughout the day. They’re also in a better mood. They are better able to acquire and perfect new skills, connect new information with current knowledge, and manage pain as the analgesic aspects of sleep increase pain thresholds. People who sleep well have better muscle mass and improved muscle memory – most of the benefits of exercise are realized during quality sleep. Repetitive motor skills involving sequences of muscle movements, such as a golf swing, improve during sleep without additional practice. Sleep also is key to skin health, as cells turn over more quickly when you sleep and human growth hormone improves skin appearance, making sleep the best way to look and feel refreshed. People sleeping eight hours per night have higher levels of the appetite-suppressing hormone leptin, helping improve weight control.13

As we sleep, our brain “prunes” out unnecessary information and the space between brain cells expands, allowing the brain to flush out waste that accumulates when we are awake. The buildup of toxins in the brain is linked to neurodegenerative disorders, such as Alzheimer’s disease and dementia. Cleansing the brain of those toxins during sleep may improve memory.14

Sleep involves the most powerful set of processes in the body when we let it happen naturally. Unfortunately, many of us put barriers in the way of sleep and then struggle with the consequences.

People who get enough quality sleep have more energy, better cognitive function, healthier immune systems, and improved memory, alertness, attentiveness and performance throughout the day.
Factors that negatively affect sleep

Barriers to quality sleep include our sleeping environment, what we ingest (food, beverages, medications, etc.), and levels of activity and stress. Medical conditions also negatively affect sleep.

**Sleeping environment**
Where and with whom we sleep makes a big difference in our ability to get adequate rest. Overly bright blue or white light is detrimental because it signals our body to wake up. Noise makes it difficult to fall asleep and stay asleep, whether the source is a television, snoring partner, noisy neighborhood or mobile device notification. Further sleep disruption can occur from having a pet sleeping in the same room. Even if you don’t realize you’ve been awakened, a beloved cat or dog can significantly reduce the quality and quantity of your sleep.¹⁵

**Temperature**
Temperature also can disrupt sleep — achieving the right temperature balance so it’s warm enough to fall asleep comfortably but cool enough to stay asleep is essential, but sometimes easier said than done. Thermal incompatibility poses a problem for people who disagree with their sleep partner about bedroom temperature.

**Mattress**
The size and condition of your mattress has a major effect on sleep. A mattress that provides inadequate support can result in painful pressure points that disrupt sleep. Nine out of 10 couples are not comfortable on the same mattress.¹⁶ Pillows and bedding play a role in sleep duration and sleep quality as well. Pillows that don’t properly support the head and neck can cause

9/10

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Discomfort, including back pain. Bedding that traps heat can be detrimental to solid sleep. (See ways to improve sleep naturally on pages 22-25 for more details.)

What we ingest
Eating too close to bedtime can increase heart rate, making it tougher to fall asleep. What we drink — especially caffeine and alcohol — and when we drink it also can negatively affect sleep. Caffeine and alcohol both elevate heart rate and blood pressure. Excessive alcohol consumption significantly disrupts REM sleep. Caffeine remains in your system for up to eight hours after you consume it. While you may be able to fall asleep, the caffeine disrupts the quality of your sleep, making it shallower and less restorative. Coffee, soft drinks and energy drinks aren’t the only culprits; caffeine is a common ingredient in many over-the-counter pain relievers and other medications because caffeine speeds delivery of the medication into the bloodstream. During the day, the body builds up adenosine, a chemical that helps activate the sleep process. Caffeine blocks adenosine receptors in the brain. Other medications and stimulants, including nicotine, can also disrupt sleep. Eating too close to bedtime also can disrupt sleep by increasing body temperature, heart rate and the likelihood of heartburn, or acid reflux.

Activity
Exercising too late in the day can raise the heart rate, making it more difficult to fall asleep (exercise earlier in the day is beneficial to sleep). Keeping an inconsistent sleep schedule also makes it more difficult for the body to fall asleep at night and awaken in the morning.

Stress
Stress-induced insomnia is a common problem. Stress makes it difficult for people to relax, slow their thoughts and fall asleep. The brain’s preoccupation also prevents normal sleep cycles from occurring. Lack of sleep also can affect the amount of stress we feel.

Medical conditions
A variety of untreated medical conditions can disrupt sleep. Sleep disorders, such as sleep apnea or restless leg syndrome, prevent people from falling into deep sleep. Asthma, allergies and other conditions that interfere with breathing, including obesity, also reduce the quantity and quality of sleep. Depression is strongly linked with sleep disorders (see more detail about health conditions affecting sleep on pages 19-20). Treating these conditions improves sleep, health and quality of life.
Inadequate sleep has negative effects on health; weight; mental and physical performance; safety; pain; and appearance. University of Chicago researchers found physical changes from loss of sleep mimic those of aging, including decreases in memory and learning functions. Research firmly links poor sleep with cardio and metabolic diseases, including hypertension, diabetes and obesity. According to the U.S. Centers for Disease Control (CDC), about half of U.S. adults have one of these conditions: high cholesterol, high blood pressure or type 2 diabetes. Recent scientific studies have shown that sleep problems are an independent risk factor for each of these conditions. According to the CDC, 71 percent of the U.S. population is overweight, including the 38 percent considered obese. Multiple studies have confirmed the link between being overweight and getting insufficient sleep. Lack of sleep contributes to weight gain in multiple ways. Sleep affects the hormones that regulate our caloric energy intake: ghrelin, which signals appetite; and leptin, which indicates satiety. When sleep deprived by as little as an hour, the tired
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Consequences of inadequate sleep (cont.)

brain continues to send the signal for hunger, resulting in overconsumption of food. As a result, people consume more than 500 extra calories every day, contributing to weight gain. The area of the brain responsible for executive function, including will power, is deficient when deprived of sleep so when people are more tired, they’re more impulsive and respond to hunger signals by making poor choices about the extra food they consume. When tired, your base metabolism also declines, so you’re burning fewer calories.23

Sleep deprivation also negatively affects athletic performance. Lost sleep affects the cerebral cortex, which is responsible for focus, concentration, flexibility and decision making. Lack of sleep slows reaction time. In a test of reaction times, people who were classified as tired performed as poorly as subjects who were legally drunk.24 Sleep deprivation has been linked with decreased aerobic endurance and increased rates of perceived exertion. Inadequate sleep affects the body’s ability to metabolize glucose efficiently and slows the body’s storage of glucose and glycogen. Athletes need glycogen for endurance events beyond 90 minutes. Endurance is therefore deeply impacted by sleep. When sleep deprived, people become exhausted sooner because the body is trying to conserve energy. Tiredness leads to overtraining because people aren’t seeing benefits from extra training, which occur during deep sleep. Sleep deprivation raises levels of the stress hormone cortisol, which may interfere with tissue repair and growth. Fatigue contributes to poor performance and changes in muscular activity, which can increase the risk of injury.25

People cannot perform tasks safely without sufficient sleep. One in five serious injuries from traffic accidents are linked to driver sleepiness.26 Each year, fatigued drivers cause 100,000 automobile crashes, 71,000 injuries and 1,550 fatalities, according to the National Highway Traffic Safety Administration (NHTSA) and National Sleep Foundation.27 Being awake for 18 hours is equal to a blood alcohol concentration of 0.08 percent — considered legally drunk in many states.28 Sleep deprivation also contributes to industrial accidents.

Sleep deprivation raises levels of the stress hormone cortisol, which may interfere with tissue repair and growth.
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Pilots, truck drivers, surgeons, air traffic controllers — these are just a few examples of jobs where sleep deprivation can lead to accidents, injuries and loss of life. Every second of work performed when sleep deprived is affected by degraded cognitive and physical abilities.

The damage from sleep deprivation is cumulative, similar to the effects of smoking. Inadequate sleep over time puts strain on the body, including the heart and cardiovascular system, and can cause permanent damage resulting in high cholesterol and blood pressure. Over a prolonged period of inadequate sleep, these conditions can become irreversible. Poor sleep is a root cause of many conditions that contribute to the slowing life expectancy rates in the U.S.

Pain is linked with poor sleep. More than one-third of U.S. adults ages 50 and older have chronic neck or back pain, while one in five adults in their late 40s through 80s experience recurring pain. In a vicious cycle, pain interferes with sleep and poor sleep increases sensitivity to pain. Without adequate sleep, the body is less able to repair the source of pain due to lower levels of human growth hormone. Medications that are used to treat pain alter the body’s sleep architecture, including REM sleep, leading to increased pain the next day. Fatigue and increased pain result in lower levels of activity and increasing use of pain medications, exacerbating the situation. A study by Henry Ford Hospital in Detroit found that an extra hour of sleep provided patients with levels of pain relief equivalent to a dose of narcotics, such as codeine. Better sleep is also proven to reduce back pain. In a clinical study of low back pain, sleep quality and the sleeping surface by Select Comfort, Sister Kenny Institute at Abbott Northwestern Hospital and Physical Therapy at the Marsh Health Center involving 60 subjects over a six-week period, 93 percent of the subjects sleeping on a Sleep Number® bed reported back pain relief and 89 percent reported improved sleep quality.

Inadequate sleep is linked with reduced skin health and accelerated skin aging. Poor sleep deprives skin of human growth hormone, which promotes cell health, resulting in premature skin aging and a decrease in skin’s ability to bounce back after sun exposure. Lack of sleep can cause puffiness and dark circles around the eyes.

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Link between sleep and health conditions

Many health disorders are instigated or exacerbated by poor sleep.

Memory loss
During quality sleep, the brain is pruned of unnecessary clutter and cleansed. The space between brain cells widens, and cerebral fluid rushes through the brain to wash away proteins that build up as the brain burns energy. Sleep problems prevent the brain from cleansing itself of the beta-amyloid plaque that accumulates there. The brains of people with early onset dementia and Alzheimer’s disease are clogged with plaque that interferes with brain function and memory. A study released in 2014 documented a direct link between inadequate sleep and early onset dementia. A lack of sleep suppresses the body’s immune system, making it easier to get sick. If you’re sleep deprived when you get a flu shot, the efficacy of that shot is reduced. A University of Chicago study of sleep deprivation at the time of flu vaccination showed a 50 percent lower vaccine effectiveness for sleep-deprived people. The effect wasn’t just immediate – the deficit in immunization effectiveness lasted up to 30 days.

Cold and flu
Sleeping less than seven hours at night can increase your risk of catching a cold. Carnegie Mellon University researchers assessed the quality and quantity of people’s sleep at the time the cold virus was introduced and found that those who were sleeping inefficiently and getting less than seven hours of sleep were three times more likely to get sick compared to people who got eight or more hours of sleep. Even 15 additional minutes of sleep helped improve immunity. A lack of sleep suppresses the body’s immune system, making it easier to get sick. If you’re sleep deprived when you get a flu shot, the efficacy of that shot is reduced. A University of Chicago study of sleep deprivation at the time of flu vaccination showed a 50 percent lower vaccine effectiveness for sleep-deprived people. The effect wasn’t just immediate – the deficit in immunization effectiveness lasted up to 30 days.

Shift work
The World Health Organization International Agency for Research on Cancer categorizes shift work as a probable carcinogen due to its detrimental impact on health. Shift work involves circadian disruptions that pose similar health risks and the same statistical significance as exposure to chemicals that cause cancer. Nearly 15 percent of U.S. workers have shift schedules, including first responders, public works employees, military personnel, medical staff and factory workers. These workers regularly struggle with severe sleep problems that have a cumulative negative effect on their health. Denmark considers shift work an industrial injury and compensates people accordingly with funds set aside through employers’ insurance to cover employees who will develop cancer as a result of shift work.
Allergies
Sleep disorders and sleep quality are negatively affected when people are suffering from allergies. The tendency to snore increases for allergy sufferers, causing additional sleep disturbances.

Sleep disorders
Sleep apnea, restless leg syndrome, insomnia and other sleep disorders cause people to wake repeatedly throughout the night, preventing them from falling into deep, restorative sleep. Improving the airways of sleep apnea patients can reverse or mitigate the problem.

Depression
Depression and sleep are strongly linked. About 75 percent of people with depression also have insomnia symptoms. Those with a history of insomnia are four times more likely to develop depression. Depressed patients who suffer from sleep issues are less likely to respond to treatment than those without sleep problems.

Post-Traumatic Stress Disorder (PTSD)
Sleep quality plays an important role in PTSD recovery. Sleep disruption can negatively affect the efficacy of PTSD treatment.

Seasonal mood disorders
Many people living in locations where daylight is significantly diminished in winter suffer from seasonal mood disorders triggered as they get up in the dark, drive to and from work/school in the dark and occupy poorly lit buildings in the daytime. While maintaining a regular sleep schedule with exposure to bright light in the morning and throughout the day may help alleviate seasonal affective disorder symptoms, research suggests treatments similar to those used for people with insomnia also may be effective.

Pregnancy
Sleeping well during pregnancy, which can be especially difficult in the final months, may affect the type of delivery when the time comes for the baby to be born. Studies show that women who sleep less than six hours three or four days a week at the end of their pregnancies are 4.2 times more likely to have cesarean deliveries. Women with more frequent insomnia – five or more nights with less than six hours of sleep – were 5.3 times more likely to have a cesarean delivery.
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Life stages

Sleep patterns change as we age.

**Kids**

Young children are the best sleepers, in part because they are the most active throughout the day. It is important to establish good sleep habits at an early age. Newborns should sleep between 14 and 17 hours per day, infants 12-15 hours, toddlers 11-14 hours, preschoolers 10-13 hours and school-aged children 9-11 hours.

**Teenagers**

Teenagers are notoriously sleep deprived as their three sleep clocks (circadian, solar and social) are the least aligned. The pressures of social media, peer expectations of immediate electronic response around the clock, early school start times and over-committed schedules combine to squeeze out adequate sleep, which negatively affects mood, health and ability to learn. Not surprisingly, a 2016 study released by the American Academy of Sleep Medicine found that insufficient sleep increased the variability of sadness, anger and energy among adolescents. A “Sleep in America” survey revealed that 60 percent of children under the age of 18 (especially teens) felt tired during the day and 15 percent of them reported falling asleep during school. Teens should be getting 8-10 hours of sleep per night.

**Middle-aged adults**

More than 50 percent of middle-aged adults suffer from insomnia. From the ages of 10 to 20, 60 percent of human growth hormone disappears, so by middle age, people are producing a fraction of the hormones needed to repair tissue, recover from injury or a good workout, grow hair, ensure healthy skin, etc., making sufficient sleep even more important.

**Older adults**

The window of time for falling asleep narrows with age. Elderly people who are retired often have no requirement to wake up consistently each morning. Without a regular schedule, the rhythm of their circadian and solar clocks may drift apart as they nap during the day, then stay up late, which can lead to confusion and deteriorating health. Medications that disrupt sleep intensify the problem. It is important for older adults to keep the same sleep structure when they retire by getting up and being active for 15-16 hours. Maintaining the rhythm of regular daytime and nighttime activities is key to good health.
Ways to improve sleep naturally

The choices you make during the day have a significant effect on the sleep you get at night. Listed below are steps to improve sleep naturally.

**Light**
Reduce light exposure before bedtime and during sleep. An hour before going to sleep, don’t expose yourself to bright lights or electronic screens. Choose the right light — warm, soft, golden light facilitates onset of the sleep cycle. Avoid blue or white light at night that tells your body to stay awake. Before bed, draw your curtains/blinds or use room-darkening shades. Exposure to electronic screens stimulates the brain and delays production of melatonin, so avoid using electronic devices for one hour before bedtime.

**Exercise**
Exercise during the day produces better sleep. Research suggests exercise, not sleep medications, is key to combating symptoms of insomnia. Northwestern University researchers found that people who exercised reported 1.25 more hours of sleep per night. Workouts using your legs especially can lead to a better night’s sleep because fatigue produced by leg muscles acts as a natural tranquilizer. Avoid exercising an hour before bedtime, which raises the body’s temperature and heartrate, making it more difficult to fall asleep.

**Schedule**
Keep a regular sleep routine. Going to bed and getting up at the same time every day, including weekends, helps your body know when it’s time to unwind. You’ll fall asleep faster, sleep better and wake up more easily.

**Mealtime**
Don’t eat a big meal right before bed — the food elevates heart rate and body temperature. Your body needs an hour to digest food before falling asleep.

**Stress**
Stress is a significant instigator of insomnia. To help quiet the racing mind, make a to-do list before bed of the things that might preoccupy you at night. It’s important to physically write it down, rather than just thinking about it. When you’re trying to fall asleep (or resume sleeping), tell yourself that items are on the list so you won’t forget and can address them the next day.
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Ways to improve sleep naturally (cont.)

Caffeine
Avoid caffeine for eight hours before sleeping. Consuming caffeine closer to bedtime can interfere with sleep. The body absorbs caffeine quickly, but half of the caffeine remains in a person’s body five to seven hours after consuming it. After eight to 10 hours, the body is able to eliminate 75 percent of the caffeine.52

Medication
Avoid taking sleep-aid medications — they may help you get to sleep faster or sleep longer, but the quality of sleep isn’t as restorative. A main ingredient of many over-the-counter sleep aids is an antihistamine that produces other side effects, such as difficulty waking up in the morning.

Alcohol
If you drink alcohol, do so in moderation. Alcohol damages REM sleep and exacerbates breathing problems, such as snoring and sleep apnea.

Stimulants
Avoid nicotine and other stimulants, which speed up heart rate and thought, making it harder to fall asleep. The effects of marijuana on sleep are inconclusive.53

Allergens
Remove dust and reduce other bedroom allergens that can disrupt sleep by vacuuming carpeting and upholstery, washing curtains and bedding at 130+ degrees, laundering stuffed animals and using a HEPA (High Efficiency Particulate Arresting) air purifier. These filters remove 99.7 percent of dust particles so you can breathe easier and sleep better. Ten million people are allergic to cat dander, the most common pet allergy. Frequent bathing of pets who spend time outside will help minimize the allergens they bring indoors.

Avoid taking sleep-aid medications — they may help you get to sleep faster or sleep longer, but the quality of sleep isn’t as restorative.
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Pets
Provide a separate space outside your bedroom for pets to sleep. You’ll sleep better with fewer disruptions.

Temperature
Control the temperature in your sleep environment to help you stay asleep. The optimum sleep environment is 65 degrees with 65 percent humidity. At 65 degrees, our bodies remain “thermally neutral,” meaning they don’t have to do anything to create or shed heat. Body heat is released through your feet, head and hands, so keep them uncovered (or use less bedding) to stay cooler. Choose mattresses, mattress pads, pillows, sheets and other devices, such as fans, to help keep body temperature low so you can stay asleep and get better quality sleep. If the room is too hot or bedding isn’t breathable, heat is trapped next to you, making it difficult to get quality sleep. Avoid use of electric blankets — they may help you fall asleep, but the extra heat will have a negative effect on your sleep during the night. Taking a warm shower or bath before bed can help you fall asleep more easily; the warmth signals to your body that it’s time to go to sleep.

Mattress
If you wake up sore, not rested or in pain, your bed could be to blame. Your bed should be big enough to allow you to move and turn over, which will help you relax while getting to sleep. Your body is not flat, so a bed that contours to your body will provide better support and weight distribution. The shoulders, hips and lower back typically are the heaviest parts of body the body and require the most support. A mattress that’s too firm can create uncomfortable pressure points, making you toss and turn during the night.

BY THE NUMBERS

The temperature at which our bodies remain “thermally neutral,” meaning they don’t have to do anything to create or shed heat.
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Pillow
Many sleep problems are caused by pillows that don’t provide adequate support. During the day, a person’s head and neck align vertically over the spine. During sleep, muscles relax, which can place stress on the neck and back. Elevating your head and neck with a pillow until they are aligned with the spine will help you breathe more easily and improve circulation for better sleep. If a pillow doesn’t contour to your head, neck and back, sleep patterns can be drastically altered. It’s important to get the right pillow or combination of pillows to improve sleep. Using too many pillows can tilt your head forward, while the wrong pillow can tilt your head backward. Both scenarios can put strain on the neck and upper spine. Side sleepers should use medium/high thickness pillows, such as synthetic options, to fill the distance between the ear and outside shoulder. Side sleepers also may benefit from a body pillow that supports the head, neck, knees and legs. Back sleepers should try low/medium thickness with extra loft in the bottom of the pillow to cradle the neck. Stomach sleepers should use a thin/flat pillow, such as down-filled options. If you have lower back pain, try using a knee pillow to alleviate strain. Matching the right pillow with the right mattress to deliver proper support and comfort will significantly improve the quantity and quality of sleep.

Innovation
Technology can help determine how you sleep by monitoring heart rate and restlessness. Using data from nighttime activity trackers can help you learn how making changes to your daytime habits and bedtime routines affects sleep. A variety of wearable devices include accelerometers that register motion. These devices use that motion data and algorithms to predict sleep duration. If you’re wearing the device on your wrist and are restless from the waist down, however, that motion could be missed. Sleep Number® beds with SleepIQ™ technology capture full-body measurements to gather hundreds of readings per second, including motion, heart and breathing rates, and restfulness. This holistic view of an individual’s sleep provides valuable insights that help you customize your sleeping environment and evaluate changes in your activity to improve your sleep experience.
Sleep, studying and academic performance

Sufficient sleep is essential for learning. Understanding how the brain functions to build memory and proficiency at night can help students – and anyone learning new skills – more effectively plan their study approach.

- Topics involving complex thinking, such as comparing and contrasting material, should be studied before bedtime so that during REM sleep the brain can keep working. You will be better able to connect the dots in the morning after a good night’s sleep.
- Declarative memory, such as memorizing state capitals, is most effectively done when people are at their peak, typically in the morning after sleep, though that timing may vary depending upon age.\(^5\)

Most college students get much less than the recommended amount of sleep each night. More than two-thirds experience excessive drowsiness, more than a third fall asleep in class at least once a week and a quarter suffer from more excessive sleep problems, according to research by the University of St. Thomas. The study, which measured the impact of poor sleep on academic performance, found that students who slept less than six hours per night had grade point averages (GPAs) 0.5 points lower than students who got nine or more hours of sleep. Separate research published in the College Student Journal found significantly lower GPAs and more psychological maladjustment among students who slept six or fewer hours compared to students who slept nine or more hours each night.\(^5\)

**Grade point average drop for students who slept six hours per night versus students who slept nine or more hours per night.**

0.5
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Evolution of sleep science

While sleep research has come a long way in recent years, sleep science is still relatively new and not well understood by the medical profession. The first sleep disorders were finally classified in the 1980s. Sleep was not considered a medical discipline by the American Medical Association until the 1990s. Today there are 89 classified sleep disorders with medical descriptions, occurrence rate data and treatment plans, yet only a few thousand sleep centers exist across the country. According to an article in Consumer Reports, medical schools devote, on average, less than 2 hours to the topic of sleep medicine. A study in the Journal of Clinical Sleep Medicine found that only 25 percent of primary care providers asked new patients about insomnia or other sleep issues, despite the fact that many patients showed signs of sleep problems.56

Sleep research continues to evolve. Though REM sleep was discovered in the late 1950s, a more robust understanding of the role of sleep didn’t begin to emerge until the 1980s. The Stanford Center for Sleep Sciences and Medicine, a pioneer in sleep research, was founded in the 1970s.57 The National Sleep Foundation, a nonprofit scientific organization dedicated to improving health through sleep education and advocacy, was founded in 1990 (resources available at sleepfoundation.org). Sleep science is still considered a new research frontier, increasingly fueled by interest in the healing power of sleep. Sleep problems commonly remain undiagnosed and untreated due to lack of awareness about the importance of sleep, causes of sleep disruption and solutions for improving sleep naturally.

BY THE NUMBERS

89

The number of classified sleep disorders with medical descriptions, occurrence rate data and treatment plans.
Quality sleep: the center of a healthy life

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