

Circadian Rhythm and Your Sleep Routine

Dr. Mercola – February 6, 2024

Sleep is one of the great mysteries of life. For a long time, it was widely thought that sleep was little more than a waste of time. Modern research, however, has shed much-needed light on the matter, showing sleep is a crucial component of a healthy lifestyle, and that lack of sleep can have far-reaching consequences, affecting everything from mood, creativity and brain detoxification^{1 2 3 4} to DNA expression, chronic disease risk – including dementia^{5 6 7} – and longevity.

One of the most radical and recent discoveries revealing the importance of sleep for health is that each and every organ, indeed each cell, has its own biological clock. The 2017 Nobel Prize in Physiology or Medicine was awarded for the discovery of these cellular clocks, all of which work in tandem to control and maintain biological homeostasis, regulating everything from metabolism to psychological functioning.

In your brain is a "master clock" that synchronizes these clocks and your bodily functions to match the 24-hour light and dark cycle.

When you upset your circadian rhythm by not getting enough sleep, the results cascade through your system, raising blood pressure, dysregulating hunger hormones and blood sugar, increasing the expression of genes associated with inflammation, immune excitability, diabetes, cancer risk and stress⁸ and much more.

Sleep deprivation also slows your reaction time, increasing your risk of accidents. Getting less than six hours of sleep leaves you cognitively impaired. Between 2009 and 2013, drowsy drivers caused 72,000 car accidents in which 800 Americans were killed and 44,000 were injured.⁹ In 2021, police reported that 100,000 car crashes each year are due to drowsy driving, killing 1,500 people a year.¹⁰ This is more than died from those texting and drunk drivers combined. Even a single night of sleeping only four to six hours can impact your ability to think clearly the next day.

Ideal Sleep Duration for Optimal Health

According to a scientific review of more than 300 studies published between 2004 and 2014 to ascertain how many hours of sleep most people need to maintain their health, a panel of experts came up with the following recommendations.

Age Group	Hours of sleep needed for health
Newborns (0 to 3 months)	14 to 17 hours
Infants (4 to 11 months)	12 to 15 hours
Toddlers (1 to 2 years)	11 to 14 hours
Preschoolers (3 to 5)	10 to 13 hours
School-age children (6 to 13)	9 to 11 hours
Teenagers (14 to 17)	8 to 10 hours
Adults (18 to 64)	7 to 9 hours
Seniors (65 and older)	7 to 8 hours

If you're wondering what time is the best time to go to sleep, research published in November 2021 showed that there's literally a "sweet spot" for hitting the sack, with the magic hour being between 10 p.m. and 11 p.m.¹¹

Sleep Deprivation Takes a Toll on Your Health

In truth, few (if any) facets of your biology are unaffected when you skimp on sleep, as the list of health effects linked to poor sleep or lack of sleep keeps growing with each passing year. For example, poor or insufficient sleep have been linked to:

Impaired memory and reduced ability to learn new things¹² — Due to your hippocampus shutting down, you will experience a 40% deficit in your brain with respect to its ability to make new memories when you're sleep deprived.

Reduced ability to perform tasks, resulting in reduced productivity at work and poor grades in school.

Reduced athletic performance.

Reduced creativity at work or in other activities.

Increased risk of neurological problems, ranging from depression to dementia and Alzheimer's disease¹³ — Your blood-brain barrier becomes more permeable with age, allowing more toxins to enter.¹⁴ This, in conjunction with reduced efficiency of the glymphatic system due to lack of sleep, allows for more rapid damage to occur in your brain and this deterioration is thought to play a significant role in the development of Alzheimer's.

Increased risk of Type 2 diabetes — In one study,¹⁵ "excessive daytime sleepiness" increased the risk of Type 2 diabetes by 56%.

Weakened immune function — Research¹⁶ suggests deep sleep strengthens immunological memories of previously encountered pathogens. In this way, your immune system is able to mount a much faster and more effective response when an antigen is encountered a second time.

Increased risk of obesity — By causing a prediabetic state, lack of sleep increases feelings of hunger, even if you've already eaten, which can wreak havoc on your weight.

Increased risk of cancer — Tumors grow two to three times faster in laboratory animals with severe sleep dysfunctions. The primary mechanism thought to be responsible for this effect is disrupted melatonin production, a hormone with both antioxidant and anticancer activity.

Melatonin both inhibits the proliferation of cancer cells and triggers cancer cell apoptosis (self-destruction). It also interferes with the new blood supply tumors require for their rapid growth (angiogenesis).

Increased risk of high blood pressure, heart attacks and cardiovascular disease — As noted by professor Matthew Walker, Ph.D., founder and director of the University of California Berkeley's Center for Human Sleep Science and author of the book "Why We Sleep: The New Science of Sleep and Dreams:"

"In the spring when we lose one hour of sleep, we see a subsequent 24 percent increase in heart attacks. In the fall, when we gain one hour of sleep, we see a 21 percent decrease in heart attacks. That is how fragile your body is with even the smallest perturbations of sleep ..."

In his book, Walker also cites Japanese research showing male workers who average six hours of sleep per night or less are 400 to 500% more likely to suffer one or more cardiac arrests than those getting more than six hours of sleep each night.

Other research has demonstrated that women who get less than four hours of shut-eye per night increase their risk of dying from heart disease by 82%.¹⁷ In another study,¹⁸ adults who slept less than five hours a night had 50% more coronary calcium, a sign of oncoming heart disease, than those who regularly got seven hours.

Increased risk of osteoporosis.

Increased risk of pain and pain-related conditions such as fibromyalgia — In one study, poor or insufficient sleep was the strongest predictor for pain in adults over 50.¹⁹

Increased susceptibility to stomach ulcers.

Impaired sexual function.²⁰

Impaired regulation of emotions and emotional perception — Your amygdala, one of your brain's centerpiece regions for generating strong emotional reactions, including negative ones, becomes about 60% more reactive than usual when you've slept poorly or insufficiently, resulting in increased emotional intensity and volatility.

Increased risk of depression and anxiety (including post-traumatic stress disorder), schizophrenia and suicide — In fact, sleep problems are defining factors in diagnosing psychiatric disorders, and are one of the diagnostic criteria listed in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders.²¹

Premature aging by interfering with growth hormone production, normally released by your pituitary gland during deep sleep.

Increased risk of dying from any cause²² — Sleep deprivation prematurely ages you by interfering with your growth hormone production, normally released by your pituitary gland during deep sleep. Compared to people without insomnia, the adjusted hazard ratio for all-cause mortality among those with chronic insomnia was 300% higher.

Cycles of Light and Darkness Affect Your Sleep and Health

Maintaining a natural rhythm of exposure to daylight, and darkness at night, is an essential component of sleeping well. As mentioned earlier, the reason light is so important is because it serves as the major synchronizer of the master clock in your brain — the suprachiasmatic nuclei (SCN).

Most people in Western societies spend the larger portion of each day indoors, which essentially puts you in a state of "light deficiency," as the light indoors is about two orders of magnitude lower, in terms of light intensity, than outdoor light.

To maintain healthy master clock timing, it's important to get bright light exposure during the day. Many indoor environments simply aren't intense enough to anchor your circadian rhythm. The first 30 to 60 minutes of outdoor light exposure during the morning or mid-day creates about 80% of the anchoring effect.

This means that just going outside for half an hour at lunch time can provide you with the majority of anchoring light you need to maintain a healthy circadian rhythm. Exposure to early morning sunlight can be another important anchor for circadian rhythm syncing.

On the opposite end, you need to avoid bright artificial lighting after sunset, as light will impair your melatonin production. Somewhere between 50 and 1,000 lux is the activation range within which light will begin to suppress melatonin production.

One 2011 study²³ compared daily melatonin profiles in individuals living in room light (<200 lux) versus dim light (<3 lux). Results showed that, compared with dim light, exposure to room light before bedtime suppressed melatonin in 99% of individuals, and shortened the time period when the body has an elevated melatonin level by about 90 minutes.

Furthermore, exposure to room light during the usual hours of sleep suppressed melatonin by more than 50%. So, after sunset, dim the lights and use incandescent light bulbs, not LEDs or fluorescents. Red and amber wavelengths will interfere least with your melatonin production, while blue and green wavelengths interfere the most.

Sleep Debt Has Cumulative Effect

Lost sleep is lost forever, and persistent lack of sleep has a cumulative effect when it comes to disrupting your health. The good news is there are many natural techniques you can learn to restore your sleep health.

Whether you have difficulty falling asleep, waking up too often, or feeling inadequately rested when you wake up in the morning – or maybe you simply want to improve the quality of your sleep – you are bound to find some relief from my tips and tricks below.

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