

# The Truth About Sleep

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✓ Fact Checked

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## STORY AT-A-GLANCE

- › Our modern lifestyle, which glamorizes constant internet connectivity and round-the-clock activity, conspires to keep us awake far longer than is healthy
- › The standard recommendation for adults is to get seven to eight hours of sleep per night. Teenagers need around nine hours, while younger school-age children may need upward of 11 hours
- › Healthy sleep consists of five general stages, each stage lasting five to 15 minutes, with a complete cycle (light, deep and REM sleep) taking between 90 and 120 minutes. You cycle through these stages four to six times each night, and this cycling is tremendously important, from both a biological and psychological perspective
- › So far, 51 DNA markers that appear to influence sleep have been found, including markers for long and short sleep duration, morning and evening personalities, insomnia, and high or low sleep efficiency
- › Sleep deprivation has a number of concerning health ramifications, including the promotion of diabetes, excess weight, heart disease, cancer and cognitive decline, just to name a few

As a medical journalist for BBC in the U.K., Dr. Michael Mosley has put a number of different health strategies under the proverbial loupe, including the ketogenic diet, which I interviewed him about in 2014.

In this BBC program, “The Truth About Sleep,” which originally aired in 2017, Mosley investigates the health ramifications of insomnia, which is a problem he shares with many others in the world. In it, he reviews the hazards of sleep deprivation, and shares a variety of methods found to improve sleep quality and quantity.

About 70% of Britons feel they get less sleep than they need, and about a third report suffering from insomnia, Mosley says. His own problem has to do with staying asleep. While he has no problem falling asleep initially, he wakes up around 3 a.m. and has a hard time drifting off again. “I’m simply not getting enough sleep,” he says.

## **How Much Sleep Is Required for Health?**

As noted by Mosley, the standard recommendation for adults is to get seven to eight hours of sleep per night. Teenagers need around nine hours, while younger school-age children may need upward of 11 hours.

While insomnia is one reason cited for lack of sleep, there are many other causes as well, including shift work and excessive partying. Our modern lifestyle, which glamorizes constant internet connectivity and round-the-clock activity, essentially conspires to keep us awake far longer than is healthy.

How can you tell if you’re actually sleep deprived or getting the “right” amount of sleep for you? Mosley demonstrates a test that can clue you in. It’s simple. Just go to bed in the middle of the afternoon and time how long it takes you to fall asleep. To conduct this sleep onset latency test, all you need is a watch, a metal spoon and a metal tray.

Place the metal tray next to your bed and lay down, holding the spoon in your hand so that when it falls, it will fall onto the tray. Relax. When you start falling asleep, the muscles in your hand will relax, causing the spoon to drop. The clanking will wake you up. Look at your watch. How long did it take you to drift off?

If it takes you more than 15 minutes, you’re getting enough sleep. If you fall asleep in less than 10 minutes, you’re moderately sleep deprived. Falling asleep in five minutes or less is indicative of severe sleep deprivation.

# The High Cost of Sleep Deprivation

The price tag for sleep deprivation is steep. A bleary-eyed workforce costs the U.K. up to £40 billion (about \$59 billion) a year in low productivity and absenteeism, Mosley notes. When asking random people on the street what keeps them up at night, the answers are manifold.

Many younger adults cite internet videos and social media. Working out in the evening, mental worries and a disruptive partner are other reasons people give for not getting enough shut-eye.

## What Happens During Sleep?

Sleep is not just one long, solid state. Healthy sleep consists of several stages,<sup>1</sup> each stage lasting five to 15 minutes, with a complete cycle (light, deep and rapid eye movement or REM sleep) taking between 90 and 120 minutes.

A full sleep cycle starts out in light sleep and progresses through to deep sleep, then reverses back from deep to light sleep before entering REM. You cycle through each of these stages four to six times during the night, and this cycling is tremendously important, from both a biological and psychological perspective.

- **Stages 1 and 2** (light sleep; non-REM) – During the initial stages of sleep, biological processes in your body slow down but your brain remains active as it begins the editing process where decisions are made about which memories to store and which to discard.

As noted by Mosley, you drift in and out of consciousness in stage 1, before ultimately entering stage 2, at which point your brainwaves slow down.

- **Stages 3 and 4** (deep sleep; non-REM) – In these deeper sleep stages you enter into a near coma-like state, during which physiological cleansing and detoxification processes in the brain<sup>2</sup> take place.

Your brain cells actually shrink by about 60% during this deep sleep phase. This creates more space in-between the cells, giving your cerebrospinal fluid more space to flush out the debris. Before entering stage 5 REM sleep, you cycle back into stage 2.

- **Stage 5 (REM)** – During this last phase, you enter rapid eye movement (REM) sleep, where dreaming takes place. In this phase, your brain is as active as it is during wakefulness, but your body is paralyzed, which prevents you from acting out your dreams.

The frightening experience of sleep paralysis occurs when you awaken during this phase and find your body unresponsive. The “treatment” for this disorder is knowledge. You simply need to be educated about what’s happening so that you can calmly ride out the episode, which typically will not last more than a few minutes.

All of these stages are important, and it’s important to cycle through them enough times each night – especially the deeper stages. When stages 3 and 4 are interrupted or missing, your brain gets clogged with debris associated with Alzheimer’s disease and, indeed, sleep deprivation is a risk factor for severe dementia. Stages 1 through 4 are also what allow you to feel refreshed in the morning, while stage 5 is important for memory.

## **Genetic Influences**

To investigate the influence of genetics, Mosley sends off a blood sample for DNA analysis. Simon Archer, Ph.D., a chronobiologist at the Surrey Clinical Research Centre, is investigating genetic markers related to sleep characteristics and hereditary sleep problems. Fifty-one DNA markers have so far been found that appear to influence sleep.

Mosley has three genetic markers that are predictive of being a morning person. He also has five markers for long sleep duration. Taken together, these genetic markers suggest Mosley needs slightly more sleep than the average person.

He also has a marker that increases his risk for insomnia, and one associated with “low sleep efficiency in people exposed to high levels of work-related stress,” Archer says. These two markers may well help explain Mosley’s inability to stay asleep throughout the night – especially when stressed.

Lastly, Mosley has a marker for increased caffeine sensitivity and caffeine-induced sleep disruption. Caffeine is a common culprit in sleep deprivation, although many (including Mosley) believe they “can drink coffee with impunity.”

Many also turn to alcohol, thinking it helps them nod off faster. Alas, research shows alcohol consumption promotes poor sleep quality. By relaxing your throat muscles, it also promotes snoring, which can be problematic not just for the sleeper but others in the household as well.

## **Sleep Quality Affects Your Heart Health**

Sleeping poorly has a number of concerning health ramifications, including the promotion of diabetes, excess weight, heart disease, cancer and cognitive decline, just to name a few.

One interesting study<sup>3</sup> found poor sleep excessively ages your heart, thus putting you at increased risk for heart disease at an earlier age. People who got seven hours of sleep each night had hearts showing signs of being 3.7 years older, based on biological age, than their chronological age.

People who regularly slept either six or eight hours had hearts that were on average 4.5 years older than their chronological age, while those who got just five hours or less of sleep each night had the oldest biological heart age – 5.1 years older than their chronological age.

Other research<sup>4</sup> has found that even if you sleep a healthy number of hours, the quality of that sleep can have a significant impact on your risk for high blood pressure and vascular inflammation associated with heart disease.

Women who had mild sleep disturbance such as taking longer to fall asleep or waking up one or more times during the night were “significantly more likely to have high blood pressure than those who fell asleep quickly and slept soundly,” Forbes reports.<sup>5</sup>

## Other Health Impacts of Sleep Deprivation

Other examples of health problems linked to insufficient sleep include:

**Increased risk of obesity and Type 2 diabetes** – Mosley, who is at high risk for diabetes, participates in a sleep deprivation experiment to see how it affects glucose levels. As shown in many other studies, sleep deprivation causes an exaggerated rise in glucose and triggers carb and sugar cravings.

Together, this can easily lead to excess weight gain and Type 2 diabetes. A scientific review article<sup>6</sup> published in 2017 noted “difficulty initiating sleep increased the risk of Type 2 diabetes by 55%, while difficulty maintaining sleep increased its risk” by a whopping 74%.

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**Increased risk of neurological problems, ranging from depression to dementia and Alzheimer’s disease**<sup>7</sup> – Your blood-brain barrier becomes more permeable with age, allowing more toxins to enter.<sup>8</sup> 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.

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**Decreased immune function** – Research<sup>9</sup> 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.

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**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).

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**Increased risk of osteoporosis.**

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**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.<sup>10</sup>

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**Increased susceptibility to stomach ulcers.**

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**Impaired sexual function.**<sup>11</sup>

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

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**Increased risk of dying from any cause**<sup>12</sup> – Compared to people without insomnia, the adjusted hazard ratio for all-cause mortality among those with chronic insomnia was 300% higher.

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**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.

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**Increased risk of depression and anxiety (including post-traumatic stress disorder), schizophrenia and suicide** – In fact, researchers have been unable to find a single psychiatric condition in which the subject's sleep is normal.

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**Impaired memory and reduced ability to learn new things<sup>13</sup>** – 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.

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**Reduced productivity, performance and creativity.**

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**Slowed reaction time, increasing your risk of accidents on the road and at work –** Getting less than six hours of sleep leaves you cognitively impaired. In 2013, drowsy drivers caused 72,000 car accidents in which 800 Americans were killed and 44,000 were injured.<sup>14</sup>

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.

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## **Sleep Deprivation Affects Your Gut Bacteria**

Mosley also investigates how sleep deprivation affects gut bacteria, which is yet another way in which it can influence your obesity risk. As explained in "The Truth About Sleep," gut bacteria help extract nutrients from the food you eat and act as a barrier against infectious agents.

So, not only do they play a key role in your metabolism, they also influence your immune system function. By looking at stool samples, researchers have noted that sleep deprivation increases the ratio of two types of bacteria associated with obesity.

The way these bacteria promote obesity is by increasing your energy uptake. When you eat, the bacteria in your gut largely determine how many calories are absorbed. Interestingly, when sleep deprived, your gut becomes more efficient at absorbing calories, even if the amount of food you eat remains unchanged.

This may be quite beneficial if food is scarce, but when combined with round-the-clock food availability, it tends to promote obesity. According to Mosley, research has shown



that half of those sleeping five hours or less per night are in fact obese.

## **Sleeping Pills Are Far From Ideal**

Sleeping pills are a common go-to solution for those struggling with poor or insufficient sleep. Mosley interviews Dr. Sara Kayat, a general practitioner, about her views on sleeping pills. She only recommends and prescribes them for acute, short-term issues.

In the long term, they're simply not a good solution, as they create dependency. You also build up a tolerance to them, so you end up needing higher and higher doses to get the same effect.

While not addressed in "The Truth About Sleep," research has repeatedly shown sleeping pills don't provide a significant amount of extra sleep, while having a range of potentially dangerous side effects.

For example, the best performing sleep drug in Consumer Reports' "Best Buy Drugs Report" for 2015, zolpidem, allowed patients to fall asleep 20 minutes faster and sleep 34 minutes longer on average, compared to placebo.<sup>15,16</sup>

Similarly, a 2012 meta-analysis<sup>17</sup> of data from 13 studies submitted to the U.S. Food and Drug Administration found Z drugs (nonbenzodiazepine hypnotics) decreased the time it took to fall asleep by 11 to 33 minutes (average 22 minutes) compared with placebo.

Far from contributing to health, the minor increase in sleep time that sleeping pills provide has been shown to actually increase your mortality risk over the long term.

A Norwegian study<sup>18</sup> published in 2007, which included data from 14,451 men and women aged 40 to 42 who were followed for 18 years, found frequent use of sleeping pills increased men's risk of death by 150% and women's risk by 170%, after adjusting for confounding factors.

A 2010 Canadian study<sup>19</sup> of 14,117 people between the ages of 18 and 102 also found those who used sleeping pills were 1.36 times (136%) more likely to die than nonusers.

You can learn more about the hazards of sleeping pills in my May 2019 article [“Sleeping Pills Get Black Box Warning Following Accidental Deaths.”](#)

## **Resetting Your Body Clock to Sleep Better**

Mosley goes on to visit the University of Oxford, where scientists are investigating how the human body clock or circadian rhythm influences sleep. Russel Foster, a professor of circadian neuroscience, explains how the master clock in your hypothalamus is influenced by a third light-sensing system in your eyes.

Your rods and cones grab light, allowing us to see. But you also have another set of light sensors in your eyes that register dawn and dusk signals, and these cells are responsible for controlling your circadian rhythm, by communicating with the master clock in your hypothalamus.

In addition, every cell in your body has its own circadian rhythm, and all of these are coordinated by and synced to your master clock. When your master clock gets desynchronized or shifted out of phase – which can easily happen if you stay up too late watching TV or perusing your cellphone – all the other internal clocks start desynchronizing, which can trigger a cascade of health problems.

Artificial light exposure in the evening, combined with a deficiency of light exposure during daytime hours, significantly contributes to master clock desynchronization and poor sleep. Mosley visits a research laboratory on a Danish island. Built entirely of glass, the house allows your body to synchronize to the rising and setting sun.

While living in a glass house is impractical, you can reset your master clock each day by making sure you get plenty of bright sunlight first thing in the morning and around midday.

Remove electronic screens from your bedroom, such as TVs, laptops and cellphones, and stop using them at least one hour before bedtime. Really make an effort to keep your bedroom for sleeping only, without the distractions of work, school, hobbies and entertainment.

# Novel Sleep Solutions

While many insomnia treatments are obvious, Mosley found a few that are a bit more unusual, yet have published papers suggesting they might be useful. These include:

- Practicing mindfulness meditation
- Taking a hot bath or shower about an hour before bed
- Taking a prebiotic fiber supplement

Mosley and three volunteers each tried one of these strategies for seven days, and agreed they all helped improve their insomnia to some degree. Prebiotic supplementation appeared to be one of the most effective of these strategies.

Data collected by Mosley's activity bracelet showed he went from 21% activity or wakefulness during the night before taking the supplement, to 8% activity after taking it for five days. Subjectively he also felt like he slept better when taking it. For additional sleep tips, see my "[Top 33 Tips to Optimize Your Sleep Routine.](#)"

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