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How Lack of Sleep Impacts Cognitive Performance and Focus

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Sleep is an important time for the brain. Levels of brain activity change in each stage of sleep – including both rapid eye movement (REM) and non-REM (NREM) sleep – and evidence increasingly suggests that sleep enhances most types of cognitive function.

Getting enough hours of high-quality sleep fosters attention and concentration, which are a prerequisite for most learning. Sleep also supports numerous other aspects of thinking including memory, problem-solving, creativity, emotional processing, and judgment.

For people with [sleep deprivation](#), insomnia, sleep apnea, or other conditions that prevent getting adequate rest, short-term daytime cognitive impairment is common. In addition, multiple studies have linked poor sleep with longer-term cognitive decline, including the development of dementia and Alzheimer's dementia.

Thankfully, there is evidence that improving sleep can boost both short- and long-term cognitive performance. Better sleep can promote sharper thinking and may reduce the likelihood of age-related cognitive decline.

What Happens to the Brain During Sleep?

During a typical night of sleep, an individual goes through four to six sleep cycles that range from 70 to 120 minutes in duration. Both the brain and body experience distinct changes during these cycles that correspond to individual stages of sleep.

During NREM stages, brain activity slows overall, but certain pulses of brain waves remain. This pattern of brain waves is most pronounced in stage 3 NREM sleep, which is also known as slow-wave sleep or deep sleep.

In contrast, REM sleep is marked by a sizable uptick in brain activity. In many ways, the brain's activity during REM sleep is similar to being awake. Not surprisingly, REM sleep is known to produce more vivid dreams.

It's normal to cycle through both NREM and REM stages, with REM sleep being more concentrated in the second half of the night. During each part of this process, different chemicals in the brain become activated or deactivated to coordinate rest and recovery.

Experts still aren't exactly certain why sleep proceeds in this pattern, but it is believed to facilitate mental recovery, which can unlock cognitive benefits related to attention, thinking, and memory.

How Poor Sleep Affects the Brain

Without sleep, the brain struggles to function properly. Because they don't have time to recuperate, neurons in the brain become overworked and less capable of optimal performance in various types of thinking.

Poor sleep can take many forms, including short sleep duration or fragmented sleep. Both insufficient and interrupted sleep make it difficult to progress through sleep cycles in a normal, healthy way, which makes it more difficult to think straight and process information after a poor night of sleep.

The short-term detriments of poor sleep on the brain and cognition can be the result of simply pulling an all-nighter, while those with chronic sleep problems may see a continuous negative effect on day-to-day tasks. Over the long-term, however, poor sleep may put someone at a higher risk of cognitive decline and dementia.

What Happens When You Don't Sleep? The Consequences of Sleep Deprivation



What Are the Short-Term Impacts of Poor Sleep on Cognition?

The potential short-term impacts of sleep on cognitive performance are wide-ranging.

Most people are familiar with the daytime effects that result from a night of poor sleep, such as drowsiness and fatigue. In response to excessive fatigue, a person may inadvertently nod off for a few seconds, which is known as a **microsleep**.

Daytime sleepiness resulting from a night of disrupted sleep can cause serious cognitive impairments. Poor sleep reduces a person's attention, as well as their learning and processing. A lack of sleep has also been found to induce **effects that are similar to being drunk**¹, which **slows down thinking and reaction time**.

Research indicates that poor sleep quality has specific impacts on various facets of **mental function**². Insufficient or disrupted sleep can cause harm to certain parts of the brain responsible for various types of cognition.

Studies of the selective impact of sleep on cognition do not always generate consistent results. This may be the result of many variables, including differences in participants, how their sleep is changed in the research, or how cognitive effects are measured. However, there is some scientific consensus on the ways poor sleep may impair intellectual performance.

Poor sleep **diminishes placekeeping**³, which includes the ability to carry out instructions. Motor skills, keeping rhythm, and even some types of speech can decline without proper sleep.

Some studies have found lack of sleep to hinder cognitive flexibility, reducing the ability to adapt

and thrive in uncertain or changing circumstances. A major reason this occurs is rigid thinking and **“feedback blunting,”**⁴ in which the capacity to learn and improve on-the-fly is diminished.

Poor sleep can also alter **how emotional information is understood**⁵. When learning something new, analyzing a problem, or making a decision, recognizing the emotional context is often important. However, insufficient sleep – which frequently affects mood – impedes the ability to properly process the emotional component of information.

In some cases, this dysregulated emotional response impairs judgment. People who do not get sufficient sleep are **more likely to make risky choices**⁶ and may focus on a potential reward rather than downsides. It can be difficult to learn from these mistakes, since the normal method of processing and consolidating emotional memory is compromised due to lack of sleep.

Existing research strongly supports the notion that not sleeping makes it harder to think straight. Without quality sleep, people are more likely to make errors, fail to absorb new information, suffer deficits in memory, or have impaired decision-making.

As a result, poor sleep can harm intellectual performance, academic achievement, creative pursuits, and productivity at work. The cognitive impacts of poor sleep can also create health risks, including life-threatening dangers from **drowsy driving** or operating heavy machinery without adequate sleep.

What Are the Long-Term Impacts of Poor Sleep on Cognition?

Some cognitive effects of poor sleep can be felt immediately, but mounting evidence shows that sleep influences the long-term risks of memory issues, cognitive decline and dementia.

Both NREM and REM sleep appear to be **important for broader memory consolidation**⁷, which helps reinforce information in the brain so that it can be recalled when needed. For example, NREM sleep has been linked with formation of declarative memory, which includes things like basic facts or statistics, and REM sleep is believed to boost procedural memory such as remembering a sequence of steps.


Poor sleep impairs memory consolidation by disrupting the normal process that draws on both NREM and REM sleep for building and retaining memories, which is closely linked to both NREM and REM sleep. Studies have even found that people who are sleep deprived are **at risk of forming false memories**⁸. Fragmented sleep has also been found to negatively affect memory even if a person gets adequate sleep.

An analysis of more than 25 observational studies found a considerably higher risk of **cognitive impairment and Alzheimer’s disease**⁹ in people with sleep problems. In fact, that analysis estimated that as many as 15% of cases of Alzheimer’s disease are attributable to poor sleep.

Research shows that sleep helps the brain conduct important housekeeping, such as clearing out potentially dangerous substances like beta amyloid proteins. In Alzheimer's disease, beta amyloid forms in clusters, called plaques, that worsen cognitive function. Studies have found that even one night of sleep deprivation can **increase the amount of beta amyloid in the brain** ¹⁰ .





This is one possible explanation for why insufficient sleep and sleep fragmentation have been associated with cognitive decline and dementia. Furthermore, in people already diagnosed with dementia, poor sleep has been linked to a worse disease prognosis.

How Poor Sleep Impacts Cognitive Function



Short-Term




Effects of sleep deprivation can appear in the form of:

-  Difficulty concentrating
-  Decline in mood
-  Impaired memory
-  Visible signs of fatigue

Vs.

Long-Term

Sleep deprivation or fragmented sleep over long periods of time can result in:

-  Poor work performance
-  Cognitive decline
-  Heightened risk of dementia

How Does Poor Sleep Affect Creativity and Other Cognitive Processes?

Creativity is another aspect of cognition that is harmed by sleeping problems. Connecting loosely associated ideas is a hallmark of creativity, and this ability is strengthened by good sleep. NREM sleep provides an **opportunity for information to be restructured and reorganized** ¹¹ in the brain, while new ideas and links between thoughts **often emerge during REM sleep** ¹² . These processes enable insight, a core element of innovation and creative problem-solving.

Limited or restless sleep can also indirectly affect cognition because of other problems that they cause. For example, **migraine sufferers** are **more likely to have morning headache attacks** ¹³ when they do not get enough sleep, and lack of sleep can **increase the risk of infections** ¹⁴ like the common cold. Sleep deprivation may worsen symptoms of **mental health conditions** like anxiety and depression. These and numerous other physical and mental health issues are shaped by sleep quality, and may affect a person's attention and concentration.

Are the Impacts of Poor Sleep on Thinking the Same For Everyone?

Not everyone is affected by poor sleep in the same way. Studies have found that some individuals may be more susceptible to cognitive impairment from sleep deprivation, and this may be influenced by genetics.

Research has discovered that adults are better at overcoming the effects of sleep deprivation than younger people. Teens are considered to be especially high-risk for detrimental effects of poor sleep on thinking, decision-making, and academic performance because of the ongoing brain development occurring during [teen years](#).

Some studies have also found that women are more adept at coping with the effects of sleep deprivation than men, although it is not yet clear if this is related to biological factors, social and cultural influences, or a combination of both.

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Can Sleep Disorders Affect Cognition?

Sleep disorders frequently involve insufficient or fragmented sleep, so it comes as little surprise that they can be linked to cognitive impairment.

Insomnia, which can involve problems with both falling asleep and staying asleep through the night, has been connected to both short- and long-term cognitive issues.

Obstructive sleep apnea (OSA) is among the most common sleep disorders. It occurs when the airway gets blocked, which then leads to lapses in breathing during sleep and reduced oxygen in the blood.

OSA has been associated with daytime sleepiness as well as notable cognitive problems related to

attention, thinking, memory, and communication. Studies have also found that people with sleep apnea have a higher risk of developing [dementia](#).

Does Too Much Sleep Affect Cognition?

Many studies examining the effects of sleep on thinking have found an excess of sleep can also be problematic for brain health. In many cases, research has discovered that **both too little and too much sleep** ¹⁵ are associated with cognitive decline.

The explanation for this association remains unclear. It is not known if excess sleep is caused by a coexisting health condition that may also predispose someone to cognitive problems. Overall, these research findings are an important reminder that [recommendations for healthy sleep](#) involve both a minimum and a maximum duration of sleep.

Will Improving Sleep Benefit Cognition?

For people with sleeping problems, improving sleep offers a practical way to enhance cognitive performance. Getting the recommended amount of uninterrupted sleep can help the brain recuperate and avoid many of the negative consequences of poor sleep on diverse aspects of thinking.

Researchers and public health experts are increasingly viewing good sleep as a **potential form of prevention against dementia and Alzheimer's disease** ¹⁶ . Although more studies are needed to conclusively determine sleep's role in preventing cognitive decline, early research suggests that taking steps to improve sleep may reduce the longer-term likelihood of developing Alzheimer's disease.

Tips To Improve Sleep and Cognitive Performance

Anyone who feels that they are experiencing cognitive impairment or excessive daytime sleepiness should first speak with their doctor. A physician can help identify or rule out any other conditions, including sleep disorders, that may be causing these symptoms. They can also discuss strategies to get better sleep.

Many approaches to improving sleep start with [healthy sleep hygiene](#). By optimizing your bedroom environment and everyday habits and routines, you can eliminate many common barriers to sleep. Setting a regular bedtime and sleep schedule, avoiding alcohol and caffeine in the evening, and minimizing electronics in the bedroom are a few examples of sleep hygiene tips that can make it easier to rest well each night.

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