OPTIMAL SLEEP ENHANCES PERFORMANCE

Sleep is essential to health and cognitive performance. Optimal sleep builds resilience to stress, reduces our risk of chronic disease, improves our mood, and enhances attention, decision-making and memory. However, we often regard sleep as an indulgence or luxury, with most of us burning the candle at both ends, stretching our capacity and compromising our sleep.

Sleep deprivation can result after losing as little as 1-2 hours of sleep per night, with research showing impaired cognitive performance after less than 7hours sleep. One study examined the effect of sleep deprivation on cognitive performance by comparing 3 days of total sleep deprivation to chronic partial sleep deprivation (4 and 6 hours of restricted sleep over 14 consecutive days). The researchers discovered that cognitive performance deteriorated progressively over the study period in the 4h and 6h groups, with the 4h group showing the worst performance, indicating that the less sleep obtained due to sleep restriction, the more cognitive performance is impaired.

Restricting sleep to 6h for 14days had the same effect on cognitive performance as 1 night of total sleep deprivation. Interestingly, after 14 days of chronic sleep deprivation, when performance was at its worst levels, participants in the 4h and 6h groups reported feeling only slightly sleepy and were seemingly unaware of their cognitive impairment. These findings suggest that we may underestimate the cognitive impact of sleep restriction and overestimate our ability to perform when sleep is restricted.

The effects of optimal sleep and sleep deprivation are summarised below.

OPTIMAL SLEEP	SLEEP DEPRIVATION
• Promotes relaxation and recovery – building resilience to chronic stress	• Activates the sympathetic nervous system, stimulating the stress response
• Enhances attention (especially vigilance), decision-making, memory consolidation and learning	• Reduces cognitive performance with impaired vigilance, memory consolidation, learning and decision-making
• Regulates mood – reducing the risk of depression and reducing aggression	• Increases risk of developing depression, increases anxiety and aggression
• Promotes growth and repair of cells and tissues – building muscles, forming new brain cells and healing damaged tissues	• Triggers physiological changes such as insulin resistance, increased cortisol secretion and increased blood pressure
• Reduces inflammation and boosts immune system function	• Stimulates pro-inflammatory cytokines and impairs immune system function
• Regulates hormones that control hunger and satiety – helping to maintain a healthy body weight	• Increases appetite, body fat and risk of obesity
	• Magnifies the effect of alcohol on the body, so a fatigued person who drinks will become much more impaired than someone who is well-rested.

HOW DOES SLEEP EFFECT PERFORMAMCE?

Sleep deprivation is often associated with or driven by anxiety, depression and chronic stress. Sleep deprivation has many of the same negative effects as chronic stress and can aggravate the stress response, creating a vicious cycle where chronic stress results in sleep deprivation and sleep deprivation results in elevated stress levels.

Chronic stress decreases the volume of the hippocampus and prefrontal cortex (brain regions involved in memory, attention, and executive function), and increases brain volume of the amygdala (a brain region involved in fear and anxiety as well as aggression). Thus, the ability to learn and remember and make decisions may be compromised by chronic stress and may be accompanied by increased levels of anxiety and aggression. Optimal sleep increases activation of the parasympathetic nervous system – suppressing the stress response, promoting recovery and relaxation, reducing inflammation and building resilience to chronic stress.

Sleep is essential to the mechanisms of neuroplasticity – our brain's ability to change structure and connectivity in response to learning and experience. Through neuroplasticity new neurons (brain nerve cells) are created and new neural connections or pathways are formed, thereby increasing the volume and changing the structure to the part of the brain affected by the event or experience. Optimal sleep has been shown to be beneficial to neuroplasticity and learning processes, whereas sleep deprivation is detrimental to neuroplasticity mechanisms and has negative consequences on learning. The underlying mechanism linking sleep to neuroplasticity is not fully understood, however, it is widely accepted that neuroplasticity mechanisms are essential to cognitive recovery and therefore cognitive performance.

Deep sleep coincides with the release of growth hormone and the increased production of, and reduced breakdown of proteins. Proteins are the building blocks needed for cell growth and repair. The protein brain-derived neurotrophic factor (BDNF) is the most prevalent growth factor in the central nervous system and plays a crucial role in the development and plasticity of the brain. BDNF promotes the survival and aids in the regeneration of neurons, enhances synaptic growth, promotes learning and protects against cognitive decline. There is numerous evidence that BDNF expression is decreased by chronic stress. BDNF has been implicated in mood and anxiety disorders, with decreased BDNF levels found in post-mortem studies of suicide depression patients. We know that chronic stress often results in sleep disruption, and there is emerging evidence suggesting a relationship between BDNF levels and insomnia, and sleep deprivation – where the interplay of chronic stress and sleep deprivation results in decreased BDNF levels.

HOW MUCH IS NEEDED TO GAIN A BENEFIT?

The amount of sleep needed for optimal function varies between individuals and changes as we age. General recommendations for sleep duration are provided below.

AGE	RECOMMENDED AMOUNT OF SLEEP
Newborns	16–18 hours a day
Preschool-aged children	11–12 hours a day
School-aged children	At least 10 hours a day
Teens	9–10 hours a day
Adults (including the elderly)	7–8 hours a day

HOW TO GET STARTED

For most adults, 7 to 8 hours of sleep per night is recommended for optimal health and performance, however sleep need varies between individuals. Getting less sleep than your body needs creates a "sleep debt," which is much like being overdrawn at a bank. Sleep debt needs to be repaid in order to reverse the negative effects of sleep deprivation on cognitive performance.

For optimal performance and recovery aim to get at least 7 to 8 hours of sleep every night. Try to go to bed and get up at the same time every day — at the very least, on weekdays. If you get less sleep during the working week than normal, ensure you make this up over the weekend and following week if necessary.

If you are getting enough sleep but still feel tired the next day, or if you struggle to fall asleep at night, try the following tips to improve the quality of your sleep.

WANT TO KNOW MORE?

For more information on sleep physiology click here.

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