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V-Discover

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Theme : Science Behind Sleep

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Science Behind Sleep

Sleep is a normal, reversible, recurrent state of reduced responsiveness to external stimulation accompanied by complex and predictable changes in physiology. These changes include coordinated, spontaneous, internally generated brain activity and fluctuations in hormone levels and relaxation of musculatures.

✦ Sleep is a state that is characterized by changes in brain wave activity, breathing, heart rate, body temperature, and other physiological functions.

✦ Depending on the sleep stage, different physiological functions may be more active and variable (for example, during REM sleep), or less active and more stable (for example, during NREM.

What Are the Sleep Stages?

There are four stages of sleep divided into two categories. The first three stages fall into the category of non-REM (rapid eye movement) sleep. The fourth stage is REM sleep.

Stage 1, you've just dozed off and started transitioning to stage 2, which involves further slowing of activity in the brain and body. It's much easier to be awoken during these early stages of the sleep cycle About 5% of total sleep time.

Stage 2, Light sleep; your body temperature cools and heart rate drops. You become disengaged with your surroundings, although you can generally still easily be woken up. About 45% of sleep time.

Stage 3 is the deepest part of NREM sleep. In this stage, your muscles and body relax even more, and brain waves show a clear pattern of slowed activity that is markedly different from waking brain activity. It is believed that deep sleep plays an important role in recuperation of the body as well as effective thinking and memory.

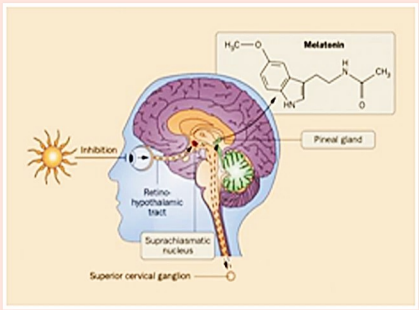
Stage 4 is the only stage of REM sleep. During this time, brain activity picks up significantly, and most of the body - except the eyes and breathing muscles - experience temporary paralysis. Although dreams can happen during any stage, the most intense dreaming takes place during REM sleep.

The REM sleep stage is believed to be essential for the brain, enabling key functions like memory and learning. As the night goes on, it's normal to spend a greater percentage of time in REM sleep with most of it occurring in the second half of the night.

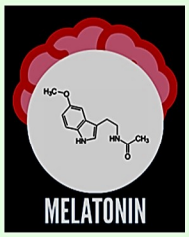
Sleep and metabolic hormones

The structure of a person's sleep stages and cycles is known as their sleep architecture. While deep sleep and REM sleep involve more profound changes in activity levels, experts believe that each stage plays a part in a healthy sleep architecture that generates quality sleep.

Our Internal Clocks

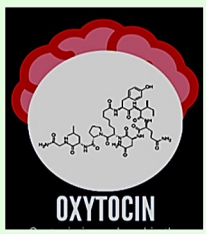


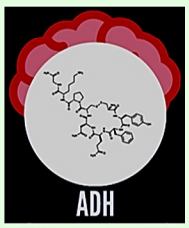
Our bodies release chemicals in a 24-hour cycle, nudging us to do certain activities at certain times. Each of these cycles is called a circadian rhythm (see " Circadian Rhythms and Life," p. 10). One of the most important chemicals involved in this process is melatonin, a hormone that makes us feel drowsy. The amount of melatonin in our bodies starts increasing in the evening and peaks in the middle of the night, letting us know it is time to sleep. It then decreases by morning, allowing us to wake up refreshed.



Melatonin is produced in the pineal gland and signals to the body it is time for sleep. It is released with increased darkness.

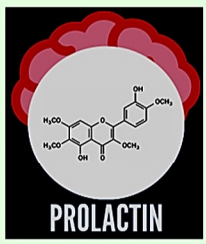
Oxytocin is produced in the hypothalamus, and its levels peak after 5 hours of sleep. It may influence the content of dreams.





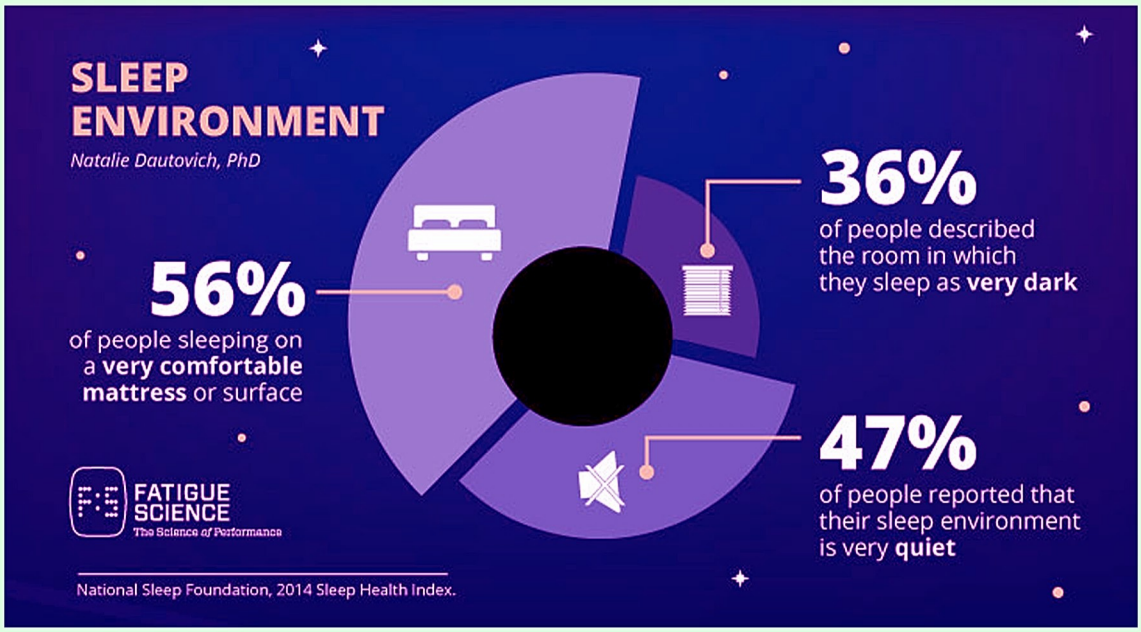
ADH is produced in the brain's pituatary gland and prevents the production of dilute urine- i.e. it stops you from peeing yourself at night.

Prolactin, produced in the pituatary gland is involved in over 300 functions including metabolism and immune system regulation. Its levels during sleep are higher than in daytime.



Sleep and Well-Being

It is impossible to overestimate the importance of sleep for our general health and well-being. Numerous health issues have been connected to inadequate or subpar sleep, such as immune system dysfunction, diabetes, obesity, and cardiovascular disorders. Moreover, research has demonstrated that prolonged sleep deprivation affects memory, emotional control, and cognitive performance. However, obtaining enough sleep and having a good night's sleep is linked to greater mental and physical health as well as an improved mood.



Why You Need Sleep

If you have ever felt foggy after a poor night's sleep, it won't surprise you that sleep significantly impacts brain function. First, a healthy amount of sleep is vital for "brain plasticity," or the brain's ability to adapt to input. If we sleep too little, we become unable to process what we've learned during the day and we have more trouble remembering it in the future.

Researchers also believe that sleep may promote the removal of waste products from brain cells - something that seems to occur less efficiently when the brain is awake.

Sleep is vital to the rest of the body too. When people don't get enough sleep, their health risks rise. Symptoms of depression, seizures, high blood pressure and migraines worsen. Immunity is compromised, increasing the likelihood of illness and infection.

Sleep also plays a role in metabolism: Even one night of missed sleep can create a prediabetic state in an otherwise healthy person. "There are many important connections between health and sleep," says Wu.

Challenges with Sleep

Unfortunately, for many individuals, achieving a good night's sleep is not always a simple task. Sleep disorders, such as insomnia, sleep apnea, restless leg syndrome, and narcolepsy, can severely disrupt sleep patterns and lead to significant daytime impairment. These disorders can have various causes, ranging from physiological factors to psychological and environmental influences.

Insomnia *is a common sleep disorder that can make it hard to fall asleep or stay asleep. It also can cause you to wake up too early and not be able to get back to sleep nsomnia can drain your energy level and affect your mood. It also can affect your health, work performance and quality of life. How much sleep is enough varies from person to person. But most adults need 7 to 9 hours a night.*

Sleep apnea *is a potentially serious sleep disorder in which breathing repeatedly stops and starts. If you snore loudly and feel tired even after a full night's sleep, you might have sleep apnea. The most frequent therapy for sleep apnea is a breathing device, such as a continuous positive airway pressure (CPAP) machine.*

Typically, ***restless legs syndrome*** *manifests as uncomfortable sensations in the legs during sleep. It might interfere with sleep and usually gets worse with age. An almost overwhelming need to move the legs is the primary symptom. It helps to move around and get some temporary relief from the uncomfortable feeling. Medication, lifestyle adjustments, and self-care techniques might be helpful.*

Those who suffer from ***narcolepsy*** *have extreme day-time sleepiness. Extended durations of sleep are difficult for those who suffer from narcolepsy. Suddenly, they are sleeping. In their regular routine, this may result in major issues. An abrupt decrease of muscular tone, or cataplexy (KAT-uh-plek-see), is another side effect of narcolepsy. Vigorous emotion, particularly laughing, may trigger this beginning.*

It is evident that prioritizing sleep is crucial for maintaining optimal physical and mental health. Neglecting sleep can lead to a range of issues, including impaired cognitive function, weakened immune system, increased risk of chronic conditions, and even mood disorders. Therefore, it is imperative to adopt habits that promote healthy sleep patterns.

Healthy tips for good sleep:

Build a regularly scheduled bedtime: Your body's internal clock is regulated when you go to bed and wake up at the same time every day, which improves the quality of your sleep.

Establish a sleeping-friendly surroundings: Your sleeping environment has a big impact on how well you sleep. Invest in a cozy mattress and pillows that support your chosen sleeping posture, and keep your bedroom quiet, dark, and cool.

Minimize consuming electronics prior to bed: The hormone melatonin, which controls sleep-wake cycles, may be inhibited by the blue light generated by computers, tablets, and cellphones.

Ensure that your schedule includes frequent exercise: Sleep length and quality have been demonstrated to increase with physical exercise. Better sleep can be achieved by doing moderate-intensity activity for at least 30 minutes each day, such as brisk walking or cycling.

Restrict the quantity of caffeine you consume: Although a morning cup of coffee might help you get started, caffeine use later in the day can cause sleep disturbances. Try minimizing your caffeine use, particularly in the afternoon and at night. Instead, go for herbal teas like lavender or chamomile that help you relax or decaffeinate-free drinks.

To sum up, understanding sleep science is essential to living a tranquil life. Through comprehension of the significance of sleep and adoption of healthful sleep practices, we may enhance our overall physical and mental welfare.

Every action you do to improve your quality of sleep, whether it's making an atmosphere conducive to rest or implementing a regular sleep regimen, counts. So let's make getting enough sleep a priority and enjoy all of its advantages. Recall that the cornerstones of a robust and satisfying existence are a well-rested body and mind.

Age group	Recommended sleep	Insufficient sleep	Oversleeping
Newborns (-3 months)	14-17 hours	≤11 hours	≥19 hours
Infants (4-11 months)	12-15 hours	≤10 hours	≥18 hours
Toddlers (1-2 years)	11-14 hours	≤9 hours	≥16 hours
Preschoolers (3-5 years)	10-13 hours	≤8 hours	≥14 hours
School-aged children (6-13 years)	9-12 hours	≤7 hours	≥12 hours
Teens (14-17 years)	8-10 hours	≤7 hours	≥11 hours
Young adults (18-25 years)	7-9 hours	≤6 hours	≥11 hours
Adults (26-64 years)	7-9 hours	≤6 hours	≥10 hours
Seniors (65 years and older)	7-8 hours	≤5 hours	≥9 hours

THE OUTLINE

For toddlers, adolescents, and adults alike, sleep is essential to health and wellbeing. The maintenance of mental, emotional, and physical well-being as well as the health of the heart, brain, and metabolism all depend on getting enough sleep *Watson NF et al., 2015.*

"If sleep does not serve an absolutely vital function, then it is the biggest mistake the evolutionary process has ever made."

Prof. Emeritus Allan Rechtschaffen has dedicated his professional life to comprehending the role of sleep. He is most remembered for having made the groundbreaking discovery that sleep is necessary for survival.

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