The Science of Sleep: What Your Brain Does While You Sleep

Have you ever thought about how sleep works and why you do it?

January 16, 2022 By Michael Breus, PhD

I've spent a long time studying, learning about, and teaching people about the science of sleep, but there are still some mysteries about this amazing and vital process.

You spend about one-third of your life sleeping, but sleep isn't as simple as closing your eyes, counting sheep, and waking up 7 to 9 hours later. Beginning when you fall asleep and ending when you wake up, your brain and your body are hard at work carrying out important life processes that you may not even realize are happening!

But what all happens while you're drifting off to dreamland? Let's take a look at why sleep is so important to your life, and what your brain does while you sleep.

Why Is Sleep Important?

Not only does sleep help you feel refreshed and energized in the morning, but it also keeps you alert and physically adept throughout the day.

Not getting enough sleep can have a profound impact on your health, worsening disorders like high blood pressure, depression, and anxiety, while also putting you at more risk of disease and accidents.

Basically, you must sleep in order to function properly. But why do you sleep, and what does sleep do for the rest of your body?

Why Do You Sleep?

Sleep for your body is like regular maintenance for your car—the proper care can ensure that both are working at their best all their lives, while a lack of sleep—or neglecting regular maintenance—can and will cause problems down the line.

Sleep helps your body and your brain recover from the current day and prepare for the next. A good night's sleep helps your body in a number of ways that you may not even realize, including:

- Repairing or regrowing the cells your body may have damaged or lost the previous day
- Strengthening your immune system
- Repairing your muscles and aiding tissue growth
- Producing and releasing your body's vital hormones
- Maintaining brain function and emotional wellbeing
- Regulating your mood, your appetite, and even your libido

Healthy sleep is also important for brain plasticity, or your brain's ability to create memories and adapt to everyday stimuli.

When you don't get enough sleep you may become sleep-deprived. Sleep deprivation makes it harder to process what you learned during the day, and makes you more likely to forget things in the future. Not getting enough sleep can also clutter your brain with a lot of information it doesn't need, since proper rest also works to discard any unneeded memories or information.

With all this in mind, you're probably wondering how your body juggles all these processes as you're winding down for the night.

How Does Your Brain Regulate Sleep?

Your sleep cycle is regulated by two systems in your body: your circadian rhythm and your sleep drive. Each of these systems helps your body prepare for sleep by following a schedule of sorts. These unique schedules can vary from person to person, but their functions are generally the same for everyone.

Your circadian rhythm regulates your body's sleep-wake cycle, and is affected by light. Normally it's affected by the sun— waking you up when the sun rises, and getting you ready for bed when it sets. Your circadian rhythm also regulates hormone production in your body, including:

- Melatonin, which helps you sleep
- Leptin and ghrelin, which control your appetite
- Cortisol, part of your body's stress response

Your sleep drive, also known as sleep-wake homeostasis, is another key factor to making sure you get the rest you need each night. Similar to how your body gets hungry when you need to eat, this function reminds your body to sleep once you've been awake long enough. This urge gets more intense the longer you've been awake. The main difference being when you're hungry, your body doesn't force you to eat—if you stay awake too long without sleep, your body can force you to sleep and recover, no matter where you are. So it's important to be somewhere comfortable and safe when you doze off.

Once these systems have prepared you for sleep, it's up to your brain to promote sleep and keep you asleep while all these processes occur.

What Your Brain Does While You Sleep

While your body is at rest during sleep, your brain is hard at work getting you ready for the next day! Each night during sleep, you go through 4 alternating stages of non-rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep.

It's during these stages that your body repairs itself and your mind refreshes.

- Stage 1 (NREM Sleep): Lasting about 7 minutes, this sleep stage occurs when you first fall asleep. Transitioning from wakefulness to sleep, your brain activity, heart rate, and eye movement all slow as your body enters light sleep.
- Stage 2 (NREM Sleep): This occurs just before deep sleep. Your body temperature drops, brain waves briefly spike— creating sleep spindles— then slows. Memory consolidation happens during this phase.
- Stage 3 (NREM Sleep): Deep, restorative sleep begins. Brain activity slows further, and your eyes and muscle movement stops. This is when your body restores its energy, and repairs cells, muscle, and tissue.
- Stage 4 (REM Sleep): This occurs about 90 minutes after you fall asleep. Your eyes begin moving quickly from side to side, your brain activity, breathing, and heart rate all increase. Dreaming happens mostly during this phase.

Dreams are another fascinating aspect of your rest. Just like sleep though, there's a lot we don't know about them.

Why Do You Dream?

Dreams are hallucinations that occur mostly during REM sleep. But why do you have them? Experts aren't really sure, but there are a few theories:

- Dreams may be your body's way of confronting difficult situations, emotions or testing your survival instincts
- They may help you process and store memories
- Dreams can inspire you and encourage your creativity

Did you know that not remembering your dreams is a sign that you slept well? It's true— not remembering your dreams means that you spent less time in lighter REM sleep and more time in the deeper, rejuvenating non REM sleep. As fascinating as they are, remembering your dreams can be a sign that you're not sleeping as well as you could be, especially if you're experiencing some not-so-sweet dreams.

Nightmares and Night Terrors

Nightmares are dreams that are frightening or upsetting. They're usually caused by stress, fear, and anxiety, but they can be focused on other negative emotions as well, including sadness, disgust, or guilt.

Experts aren't sure why you have nightmares either, but like dreams, it's commonly believed that they help you confront difficult situations. Unfortunately, nightmares often do more harm than good, and can indicate underlying health problems like a sleep disorder or mental health disorder.

Similar to nightmares are what are known as night terrors or sleep terrors. These intense episodes of fright during dreams can cause some people to scream or thrash around their bed in a panic. Unlike dreams and nightmares, night terrors happen during NREM sleep. Night terrors are most common in children—up to 6 percent of children experience them— but adults can experience them too.

An occasional nightmare isn't a cause for alarm, but if you have frequent nightmares or experience sleep terrors, then it's important to get yourself checked for other conditions that could be causing you unrest.

Never Ignore Sleep Disturbances

Bad dreams or things that go bump in the night aren't the only things that can ruin your sleep. Insufficient sleep and poor sleep quality can be caused by a lot of things, including:

- Sleep disorders, including insomnia, obstructive sleep apnea (OSA), or hypersomnia— sleeping too much
- Jet lag
- Poor sleep habits
- Health conditions like obesity, high blood pressure, or chronic pain
- Mental health conditions like depression or anxiety

There are many ways to improve your sleep—some of the best ways include following a consistent sleep schedule, practicing relaxation or mindfulness exercises, and living a healthy lifestyle. Even with the proper precautions, it's still possible for you to experience sleep loss.

If you're struggling to sleep, are sleeping too much, or consistently wake up feeling awful, it's important to talk to your doctor or a sleep expert about your symptoms. Sleep problems don't go away on their own, so it's key to seek treatment if you think something is amiss. Quite often though, sleep problems can be easy to resolve with a little professional help. If you're not sure where to find a sleep center or sleep expert near you, I recommend using this tool from The American Academy of Sleep Medicine.

There's so much more to sleep than you may realize— it's a fascinating subject, and I hope this article will encourage you to look through the rest of the site and learn more!

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