

This Is What Your Brain Does During Sleep

By Gary Greenberg

Our brains love sleep. Good quality sleep helps the brain fine-tune its circuitry, optimize data storage, compartmentalize emotional baggage, and flush out metabolic waste products.

“Sleep is essential for the brain, which is the most metabolically active organ in the body,” says Alex Dimitriu, M.D., founder of Menlo Park Psychiatry & Sleep Medicine in California. “Like a house after a wild party, the brain needs a complete shutdown for a thorough clean-up after each day.”

Sleep Triggers

Sleep is triggered by a few factors, including the biological clock controlled by a structure in the brain called the suprachiasmatic nucleus. In addition, light and darkness regulate the sleep hormone melatonin. Our sleep drive is also related to the buildup of adenosine — a biochemical byproduct of burning energy — that accumulates in the bloodstream and inhibits neural activity, making you drowsy.

Understanding Sleep

The first stage of sleep quiets the brain’s thalamus, which relays motor and sensory information between the body and cerebral cortex. This separates you from the physical world. In the second stage, brainwaves further throttle back as body temperature drops, and heartbeat and breathing slow down.

The third stage is slow-wave sleep (SWS). Brain activity, heartbeat, and breathing all fall to their lowest levels, marking the most restorative stage of sleep. The final stage is rapid eye movement (REM), when dreaming occurs. You experience hallucinations, delusions, disorientation, unbridled emotions, and, eventually, amnesia (for the most part). Ironically, this is good for mental health.

It takes 90 minutes to cycle through the three stages of non-rapid eye movement (NREM) and REM sleep. The cycle is repeated throughout the night.

Getting quality sleep is particularly good for the hippocampus, a structure in the brain that acts like a computer’s RAM. The hippocampus stores perceived information until the slow-wave stage of sleep, at which point it uploads the data to the “hard drive” of the cerebral cortex.

A study by the Center for Human Sleep Science at the University of California, Berkeley, found that sleep deprivation after learning inhibited transfer of information from the hippocampus to the cerebral cortex by about 40 percent. Meanwhile, quality sleep before learning frees up space in the hippocampus to store new data.

Sleep and Emotions

Getting up “on the wrong side of the bed” is caused by a poor night’s sleep. During deep sleep, the frontal cortex — the brain’s

CEO — regulates the amygdala, which is the emotional center. Poor sleep breaks that connection, allowing emotions to run amok.

“During REM sleep, the brain processes emotional memories, almost like a form of self-therapy,” Dimitriu tells *Health Radar*. “It also processes and ‘seals’ past emotional experiences. With sleep deprivation, mood and anxiety symptoms can worsen.”

Sleep deprivation is closely associated with mental illness. “Nearly all psychiatric mood disorders display co-occurring abnormalities of sleep,” says Matthew Walker, Ph.D., a professor of neuroscience and psychology at the University of California, Berkeley.

As we age, we lose up to 70 percent of the time we spend in deep sleep, which translates to a 50 percent loss in memory capability, according to Walker. “Disrupted sleep may be an underappreciated factor in cognitive decline,” he notes. “The silver lining is that it’s a potentially treatable target. If we can restore some quality of sleep in aging, we may be able to give back some memory function.” □

Tips for Better Sleep

- Get regular exercise
- Maintain a sleep routine
- Cut out electronics an hour before bedtime
- Keep your bedroom dark and cool
- Take a warm bath before turning in