



## The Importance of Sleep



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Truthfully, I am usually half asleep by the time I am finished writing these health-related articles. I have bought into the American work ethic: work long hours, work on weekends, take fewer vacations and get less sleep. In medicine, this "expectation" is embedded into the culture of health professionals, just like nutrient-poor food is an expectation of a hospital stay. Kind of ironic isn't it? The authorities who are providing the health guidelines don't practice what they preach. But even Benjamin Franklin warned us about the uselessness of sleep. In Poor Richard's Almanac he wrote, "there'll be sleeping enough in the grave." More currently, 40% of Americans (including myself) agree that sleep is as important as diet and exercise to overall health and well-being.

Yet we're all sleeping less. Children are sleeping about 100 minutes less than they were 100 years ago. Adults are sleeping 1½ hours less than they were 50 years ago (from 8 ½ to just under 7). We seem to be reluctant to give up 1/3 of our lives to this non-productive state of sleep. But sleep is far from non-productive.

Sleep is actually an active period for restoration, strengthening and processing. During sleep we move tidbits of information from short-term temporary memory to long-term memory in a process called consolidation. In one study, researchers asked subjects to play a computer game for several hours per day over a few days. When the subjects were purposefully woken while falling to sleep, they recalled images of the game during this Stage 1 sleep. This consolidation process helps us to retain relevant information and improve memory. Researchers have learned that lack of sleep impairs a person's ability to focus and learn efficiently. Studies

have shown that problem solving is more successful in subjects with sufficient sleep vs those who are sleep deprived. Sleep is also needed for restorative functions: growing muscle, repairing tissue and synthesizing hormones. My favorite task of sleep is detoxification. During sleep, spaces in the brain widen to allow the cerebrospinal fluid to provide us with a "brain wash" so that accumulated debris (toxins and misfolded proteins including beta-amyloid, the protein associated with Alzheimer's disease) can get cleared. This is one reason neurodegenerative diseases are associated with sleep deprivation. Sleep disturbances are often an early sign of dementia.

According to the National Institutes of Health, adults from 19 to 64 years old need 7 – 9 hours of sleep per night. After age 60, the recommendation is 7 – 8 hours as nighttime sleep is often shorter, lighter and with multiple awakenings (often to urinate). The shorter duration may be due to taking medications that interfere with sleep or due to purposeful but often inadvertent daytime napping. The sleep recommendation for babies is 16 – 18 hours per day and for school-aged children and teens it is 9.5 hours per night.

The places to go, things to see, expanding "to-do" lists and information overload seem to enable many of us to sacrifice sleep time. Even if we choose to prioritize sufficient quantity of sleep it does not guarantee proper quality of sleep. Researchers tell us that sleep architecture is made up of 2 different kinds of sleep: REM (rapid eye movement) and non-REM sleep (in 3 stages). We cycle through these 3 stages and REM sleep several times during the night (ideally 4 – 5 times). Stage 1 non-REM sleep is the brief falling asleep stage where heart rate, respiratory rate and eye movements slow. Muscles relax and may twitch a bit. Stage 2 non-REM sleep is light sleep where body temperature drops and eye movements stop. A lot of time is spent in this stage. Stage 3 non-REM sleep is deep sleep. The heart rate and respiratory rate are at their lowest in this stage. It is difficult to be awoken. REM sleep does not occur until about 90 minutes after falling asleep. Although the eyelids are closed, the eyes are moving

rapidly from side to side (hence the name). This is the time when most dreaming occurs. Heart rate, blood pressure, respiratory rate and brain waves become similar to the waking state but arms and legs are paralyzed so that one cannot act out their dreams. REM sleep should make up about 25% of total sleep but less time is spent in REM sleep with age.

Each stage of sleep is recognized by its particular brain waves indicating different functions are occurring in the brain. Stage 3 sleep is necessary in order to feel refreshed in the morning. Most of it occurs in the first half of sleep, which is why it is important to have the first 4 hours of sleep uninterrupted. Memory consolidation requires both REM and non-REM sleep. Dreaming occurs mostly in REM sleep. There is a genetic condition called REM-Sleep Behavior Disorder where the usual limb paralysis is overcome and people physically act out their dreams. This disorder is often associated with the future development of neurodegenerative diseases.

The sleep-wake cycle is controlled by 2 mechanisms: the 24-hour circadian rhythms and homeostasis. The circadian rhythms are biological clocks that control sleep-wake cycles, body temperatures, metabolism, and release of hormones. The central circadian clock in our brain influences many other peripheral circadian clocks including those in the liver, pancreas, fat tissue, heart, intestines, muscle, white blood cells, kidney, and breast. Influence on these peripheral organs is why circadian sleep disorders are associated with so many other indicators of poor health. Homeostasis is the body's adjustments to attain balance and it keeps track of the need for sleep (and other functions) when we disregard the biological clock. Many factors can influence circadian rhythms including genetic vulnerability, age, sleep disorders, light, melatonin, physical activity, feeding, socialization, psychological well-being, work schedules, certain medications and drugs including alcohol. Many of my patients don't realize that the factor contributing to their frequent waking at 2 or 3am is the 2 glasses of wine they had in the evening. Another incentive I use to encourage better sleep

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**IMPROVING SLEEP**

- Get your Sleep-Wake cycle on a schedule – go to bed and wake up at the same time each day. Research has shown that sleep variability is one of the most important factors in determining how well we sleep.
- Get some physical activity daily but don't do exercise 3 hours prior to going to bed.
- Avoid caffeine, chocolate and nicotine later in the day. (Really - avoid nicotine completely!) Avoid too much alcohol too late in the evening. (These recommendations vary in individuals.)
- Avoid going to bed hungry or eating too late or too much before bed.
- Have some down-time before bed: read a (print on paper) book, take a bath with Epsom salts.
- Avoid catching the "second wind". This is a cortisol (stress hormone) release. It may help you meet your dead-line but research has shown that high levels of cortisol reduce REM sleep and that people with chronic insomnia have persistently elevated levels of cortisol.
- Lower exposure to blue light at least 2 hours before bedtime by eliminating screens or using blue-blocking glasses and blue light screen-blockers (f.lux software for screens, biohacked.com for glasses). Dim monitor brightness settings and reduce blue tones.
- Create an optimal sleeping area: comfortable, cool temperature, quiet and dark with no TV, mobile phone, or computer screen nearby. Change the lightbulbs to amber or red.
- Use ear plugs, sound soothers or sound cancelling devices if needed.
- Working with your functional medicine doctor you can: balance neurotransmitters with 5-HTP, increase the relaxing GABA hormone or use supplements like valerian root, L-theanine, melatonin, phosphatidylserine, inositol, CBD, or magnesium.
- Get natural sunlight in your eyes in the morning to turn off melatonin.



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hygiene is clarifying its influence on weight. Too little sleep has been associated with over-eating, unhealthy food choices, and weight gain. A 2016 study showed that sleep loss increases levels of the chemical signal 2-AG. This endocannabinoid enhances the pleasure of eating – mostly sweet, salty and fatty snack foods!!!

Perhaps the biggest sabotage to 21st century sleep is our over-exposure to light. Our circadian clock is very sensitive to light. It increases melatonin (the hormone that promotes sleep onset) in darkness and inhibits melatonin in the presence of light. It is most responsive to the short wavelength blue light. Blue wavelength light during the day promotes healthy attention, reaction times and mood. Blue light during the "dark hours" tells our brains it is daylight and inhibits melatonin production. This alters our circadian rhythms and disrupts sleep with all of the health consequences described above including increased risk

of cancer, diabetes, heart disease and obesity. Blue wavelength light was absent in light sources of long ago (candles, lanterns and fires). However, our evenings (and night times) are washed in blue light from our electronics with screens (TVs, phones, tablets and computers) and our energy efficient lighting (LED bulbs especially). Lifestyle changes that reduce blue light in the evening and night are an important part of sleep hygiene and overall health promotion – especially for us night-owl worker bees. I'm getting my own message...

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