



sleep
tight

The Smarter Way
To Sleep, Dreams, And Health

Luna Green

...a concise and comprehensive guide that is ideal for anyone who has wondered about sleep... a handy, informative, and eminently readable user manual...

Readers' Favorite

...a helpful little guide describing what good sleep is, why we need it, and most importantly, how to achieve it.

Indies Today

to early birds and night owls

Introduction

Adulting is hard work, and it seems that one of the conditions for getting it done right is being constantly sleep-deprived. We joke about it, too, as evidenced by the constant outpour of memes on the internet. But the truth is that sleep deprivation is no laughing matter.

And it's expensive, too. It costs the United States over \$400 billion every year directly. And this doesn't even tabulate the cost of much of the resulting diabetes and obesity, which, taken together, is many times greater. Quite shocking. But it should come as no surprise when up to 70 million residents of the US suffer from at least one sleep disorder or another, and these figures don't even account for the people who just don't get the recommended amount of daily sleep in the first place. Indeed, our sleep is so bad that the World Health Organization has declared a sleep loss epidemic!

The monetary cost of not getting enough sleep is great, but the dangers to ourselves and our health are devastating and far exceed money. Atherosclerosis, cancer, coronary heart disease, depression, diabetes, dementia, depression, immune deficiencies, obesity, ongoing negative thoughts, suicide, stroke, plus various other horrible conditions that severely decrease our quality of life (and shorten it) can all be linked back to sleep deprivation.

Of course, the consequences of sleep deprivation don't have to lead to such dangers for us to realize that it's a serious issue, because being sleep deprived can interfere with our day-to-day activities, wreak havoc with our emotional control and increase hostility, anger, and negative thoughts, make our productivity and efficiency fall sharply, ruin our concentration, and cause dangerous episodes of micro-sleep, leading, no doubt, to many (if not most) of the vehicle collisions and their resulting fatalities that we deal with every year. Maybe most alarming of all is that when we're sleep deprived for extended periods of time we don't even know it because we acclimate to our new condition, thinking that our current performance, concentration, energy levels and negative thoughts and emotions are normal!

We know that sleep is important. Sleep is extremely important. So important in fact that sleep deprivation is probably the number one health issue that you can face, both neurologically and physiologically. Conversely, sleep is probably the most performance enhancing thing that you can ever do, far surpassing the effects of any drug, diet, or exercise regime that we have or know about.

Do not wait until it is too late to curb bad sleep habits and replace them with healthy ones that can help you grow and develop. Not only will you benefit, but your family, friends, and colleagues will benefit, too. However, despite its benefits, it's not easy to attain for many, and so this book has been written to help you more easily get the quality and quantity of sleep that you need.

What follows is a compact yet valuable repository of information for anyone who has missed out on more than a few hours of sleep... and let's face it, that is everyone over the age of 5 years old! And, sadly, maybe even many of those below it.

Getting enough sleep is an underrated means of becoming healthi-

er, happier, and feeling more fulfilled in your daily life. It's as important as your diet and getting regular exercise—even more so due to the deleterious effects that result from just a singular instance of neglect. Sleep allows you to perform your best. Physically, mentally, and emotionally. Indeed, good sleep directly equates to better performance, a healthier body, healthier organs and a healthier mind. It is truly one of the very best things that we can do for our health, so let's get started on healthier, happier living... one shut-eye at a time!

Sleep

Sleep is facilitated by a natural 24-hour pattern known as the *circadian rhythm*. It does many things, but that which we're most concerned with here is its influence on our wake and sleep cycles as it is this rhythm that causes us to feel awake and alert or tired and sleepy at regular intervals throughout a 24 hour period. Technically, the circadian rhythm is a biochemical process, but that's pretty abstract to most of us so with a bit of artistic license we can say that it's a cycle that communicates the time of day to all the organs of the body (including the various regions of the brain). It's a clock, in other words, is found in nearly every cell, and is controlled by a master clock located in the brain (the *suprachiasmatic nucleus*¹). It's extremely old. So old in fact that it's thought to have originated in the earliest cells, and all creatures that live more than about a week or so have it.

The cycle of rhythm itself is approximately one day (as evidenced by the naming of it) and it's what woke the early humans in the morning and what made them go to sleep at night. It's not perfect, and can be disturbed by our behaviour and outside influences. The most reliable influence on it in an adult is *changes in light and darkness*. Food is

¹ A region of the brain that regulates many different body functions by way of generating hormonal and neuronal activity.

also a heavy influence, as is age (with young children it's shifted backwards and with teenagers it shifts forwards, which is why teenagers are fully alert and awake at 9pm and groggy and still half asleep at 7am).

However, whilst these things have a strong influence on the rhythm they don't explicitly change it but rather only reset it (which keeps it synced up with our 24 hour day), and the timing of the rhythm is actually internally controlled by our genes. We will be manipulating and controlling the rhythm later when we discuss the strategy for getting a good night's sleep.

What Is Sleep

What is this thing called sleep anyway? We all have a notion of what it is, but sleep isn't the body's way of shutting down for a few hours as can mistakenly be believed since the body and brain are still working just as diligently when we're asleep as when we're awake.

A reduced blood pressure, body temperature, heart rate, and metabolism are signals that are sent throughout the body to prepare it for sleep, and sleep itself is the condition whereby the eyes are closed, the muscle posture of the body is relaxed, and the nervous system is relatively inactive as the state of unconsciousness² is assumed.

Important processes such as restoration of cells, the brain processing of information about the day's events, the creation of long-term memories, the release of specific hormones³ needed for body repair and rejuvenation, and beefing up of the immune system all happen while we sleep. I like to think of sleep as the body's automatic way of pushing back against entropy, and whilst that's not strictly true, sleep is certainly the thing that the body uses and requires in order to keep the system fresh and renewed on many levels.

² Perceptual signals are blocked by the thalamus from reaching the cortex

³ A communication and regulatory substance produced within us.

All of these things that sleep does don't happen all at once, though, and we need a certain amount of time asleep to fully get the benefits that it provides.

How Much Sleep?

The amount of sleep a person requires is largely dependent on their age,⁴ with infants and babies requiring far more than an adult (generally, 16 or more hours a day). On average, teenagers need about 9 hours and adults need 7–8 hours for optimal performance. But this is an average and can vary by individual, as well as by sex (with women needing about 20 more minutes than a man).

There are also other factors that determine how much sleep a person needs. Fighting off infections is one routine example that results in more sleep being required. A woman in her first trimester is another. We also need more if we've been sleep deprived because sleep deprivation creates a sleep debt, and a sleep debt needs to be repaid with increased amounts of sleep in subsequent days—a sizable debt cannot be repaid in full all at once though and we need several days to pay back such a debt.

Having to repay a sleep debt is a common enough experience for most of us as we all sacrifice some sleep every now and then to do things that need to be done. However, there are persons who do not get enough sleep over protracted and extended periods of time. This ongoing sleep deprivation creates an accumulated sleep debt that causes impairment in parts of this person's life. This type of ongoing sleep deprivation is called *chronic sleep deprivation*.

⁴ Sex hormones are quite likely the main driver as to why age affects sleeping patterns.

Chronic Sleep Deprivation

Here are a few signs and symptoms of possible chronic sleep deprivation:

- Routinely not feeling refreshed upon waking up.
- Routinely yawning throughout the day.
- Routinely finding it difficult to stay awake during daytime hours.
- Routinely having trouble concentrating.
- Routinely lacking the energy to perform daily tasks.
- Routinely head nodding.
- Frequently drifting out of your lane while driving.
- Routinely feeling irritable and becoming easily annoyed.
- Routinely having dark circles and bags under your eyes (although not solely caused by sleep deprivation; genes, hormones, diet, smoking, age, allergies and sinus problems, water retention, dehydration and sleeping on your front are all possible causes).

Chronic sleep deprivation can occur for many reasons, including:

- Being overworked.
- Being stressed.
- Consuming too much caffeine or alcohol before bedtime.
- Having too much screen time before bedtime.
- Medical illness.
- Medications.
- Sleep disorders.
- Vigorous school and work schedules.

The Negative Impacts of Chronic Sleep Deprivation

The effects of chronic sleep deprivation are varied, but they affect us physically, mentally, and emotionally.

The physical effects include, but are not limited to:

- Higher risk of mortality.
- Frequent headaches and migraines.
- Increased risk of developing high blood pressure, heart disease, fibromyalgia,⁵ stroke, type 2 diabetes, and obesity.
- Lowered libido and fertility.
- Increased appetite (often leading to weight gain).

The mental and emotional effects include:

- Decreased social acuity (inability to read emotions and faces).
- Hallucinations.
- Impaired memory and false memories.
- Inability to process emotions effectively.
- Inability to think clearly.
- Increased risk of developing mental illnesses such as Alzheimer's, anxiety and depression.
- Increased stress levels.
- Mood swings.
- Ongoing negative thoughts.
- Trouble concentrating and staying focused.

⁵ Chronic and widespread pain and tenderness all over the body. Further symptoms are varied, but include anxiety, fatigue, headaches, irritable bowel syndrome, problems with mental processes, sensitivity to pain, and sleep disturbances.

The Benefits of Getting Enough Sleep

As you can see, the consequences of sleep deprivation can be pretty dire, but if the consequences are not enough of an incentive to improve your sleep habits then maybe converting some of them to benefits will convince you to get more shut-eye:

- Being more relaxed and less stressed.
- Better weight management. Getting enough sleep helps regulate the hormones (such as ghrelin) that affect your appetite and helps reduce your food cravings and increases insulin sensitivity.
- Decreased stress levels (hormone levels, such as cortisol, are better regulated)
- Healthier heart.
- Healthy immune system. Getting enough sleep allows the body to produce the cells and regulate processes needed to keep the immune system strong.
- Improved memory. The brain uses the time that we sleep to organize and store memories, and lack of sleep therefore disturbs this process. Getting enough sleep allows your brain to process things better and allows you to improve your memory capacity.
- Lowered blood pressure.
- Makes you live longer.
- More productive and effective on a daily basis.
- Reducing your risk of developing type 2 diabetes.
- Stabilizing your mood, more positive thoughts, and a brighter outlook on life in general.

If the benefits of sleep could be harnessed into a pill it would most certainly make the creator very rich indeed!

Sleep is also not a static process, it has cycles and stages, which we'll cover next.

Sleeping

Sleep is compartmentalized in various ways depending on who's talking and what they're trying to say. There is light, deep, and REM (rapid eye movement) sleep. There is stage 1, 2, 3, 4 and REM—which can also be called light sleep, moderate sleep, deep sleep and dreaming. There's also just REM and Non-REM (NREM) sleep, where NREM is any part of sleep that isn't REM sleep.

How it's classified by any one person largely depends on what the information is that they're trying to convey, and so they use whichever classifications works best for them with that information. I will attempt to use them in a way that I hope will consolidate them for you so as to remove some of the confusion.

The Sleep Cycle

Stage 1 is basically where you're just nodding off. It lasts a few minutes. It is the 'catnap' stage. You can be easily woken during it and may sometimes experience the falling sensations and the bodily jerks (caused by seemingly random and spontaneous stimulation of the motor cortex). Stage 1 is light NREM sleep.

Sleep past stage 1 and you enter stage 2—the ‘power nap’ stage. It is here that short-term memories of the hippocampus are transferred to the neocortex for more robust storage. It is also a relatively light stage of sleep and you can be easily woken during it. Stage 2 is light NREM sleep.

Stages 3 and 4 are the deep sleep phases. It is difficult to be woken up during these stages and they are important for feeling refreshed and having energy the following day. These stages are when the body repairs itself, stimulates growth and development and boosts the immune system. Stages 3 and 4 are deep NREM sleep.

After these stages have happened we enter REM sleep, and the ‘sleep cycle’ is so called because we cycle through all of these stages (including REM) before beginning the cycle all over again. The total time of the cycle is roughly ninety minutes, and the time spent in each stage of the cycle changes with the amount of time that we’ve been asleep, with most of our deep sleep (NREM) happening in the first half of the night and most of our REM sleep happening in the second half of the night. That is, stages 3 and 4 last the longest in the first half and REM lasts the longest in the second half. Stage 2 also gets a nice boost in duration during the last 2–3 hours of an 8 hour sleep, and it is in these stages of sleep that our brain is cleaned of toxins by way of flushing cerebrospinal fluid¹ through it.

Time spent in each stage also changes based on age, with pre-6 months having a roughly 50/50 split of NREM to REM, rising to a roughly 70/30 split (NREM to REM) at about 5 years of age and then from our late teens and onwards we spend about 80% of our time in NREM and 20% in REM.

¹ A fluid found in the brain and spinal cord providing mechanical and immunological protection to the brain.

REM Sleep

During REM, breathing quickens and the heart rate speeds up. The muscles are paralyzed (called *REM atonia*) due to the brain not stimulating the motor neurons. This paralysis makes you utterly limp and prevents you from acting out any of the activities of your dreams. This paralysis can also carry over into wakefulness (known as *sleep paralysis*), and can even last up to 10 minutes. It can be a scary affair, but rest assured that muscle control will return. The brain is very active during REM sleep, getting strong activation in various regions (emotional, visual, and autobiographical memory) along with a relative deactivation of rational thought regions. It is when our dreams are most vivid and readily recallable.

REM sleep is important for:

- Neural wiring and connectivity (which likely explains why babies spend a higher percentage of time there).
- Easing of emotional turmoil—the chemicals that instigate the fight or flight response are ignored by the brain during REM sleep, which allows us to revisit unpleasant memories without the emotional response and connotations attached to them. This unattached experience attenuates their negative effects.
- Creativity. We get an increase to the efficacy of our relational memory during REM sleep. That is, the connectivity of distant and seemingly disparate knowledge gets integrated into a coherent whole leading to unforeseen associations between them, leading to enhanced creativity.

NREM Sleep

Typically, we get less NREM sleep as we get older, but we still actually need as much of it as we did when we were younger. NREM sleep comes in two types, light and deep. It is responsible for:

- Brain maturation.
- Solidification of memories, particularly strengthening and cementing the memory of facts—it helps to prepare the brain for making new memories and helps to consolidate and cement those memories so we don't forget them.
- Memory discernment. That is, NREM sorts the memories into those to remember and those to discard.
- The enhancement of motor skills and the instilling of motory habits. That is, the automation of movement, such as a tennis swing or the playing of an instrument.
- Cleaning and flushing the brain of various toxins, such as *beta amyloid* and *tau* (both associated with Alzheimer's), the former of which is a protein that builds up in the brain and results in degradation of those brain regions that it forms in. It's a vicious cycle, because the build up of amyloid inhibits NREM, and lack of NREM results in more amyloid.
- Lowering physiological stress by calming the sympathetic nervous system, resulting in lowered blood pressure.

Deep Sleep

Although none of the stages of sleep is more important than any other because no one stage of sleep accomplishes all of the functions that sleep performs (so missing out on any stage causes impairment), adults who gain a healthy amount of sleep need an average of 20% deep sleep. Not getting enough deep sleep results in important functions not taking place, including:

- Memory consolidation.
- Boosting of the immune system.
- Solidifying the brain's processing power.
- Facilitating physical recovery of any injuries or damage to the body.
- Facilitating the stabilization of blood sugar levels and metabolism.

Not getting enough deep sleep is often the result of external environmental factors interrupting it, and we'll discuss strategies for minimizing these factors in the chapter *A Good Night's Sleep*.

Successful Sleeping

Getting the recommended number of hours of sleep every night is important, but this sleep quantity is not the only factor that determines how well-rested you feel the next morning, there is also sleep *quality* and sleep *efficiency*.

Sleep quality is determined by how quickly you fall asleep and how often you wake at night—if it takes you ages to drop off and you wake up often then your quality of sleep is low. Good quality sleep is needed to avoid sleep deprivation.

Sleep efficiency is the actual percentage of time that you spent asleep when in bed. If you immediately went off the moment your head hit the pillow and you got up the moment you awoke your sleep efficiency would be 100%. A 95% efficiency is excellent and is somewhat unlikely to be attainable for most people for long periods. 90% is good. 85% could be improved. Below 80% is poor. 75% and below is the realm of insomniacs.

In order for you to feel your best-rested, both sleep quality and quantity need to be balanced. When the scales tip in any one direction, sleep hygiene is compromised. However, good sleep quality may be more beneficial than sleep quantity in regards to the restorative benefits of sleep.

Sleep Efficiency

Having good sleep efficiency is having a sleep efficiency of *at least* 85%. Being in bed for a long period of time is not an indicator of good quality sleep because you may be awake for a sizable amount of that time. To find your sleep efficiency (the percentage of time spent asleep): divide the amount of time you spent asleep by the total amount of time that you spent in bed, then multiply by 100. For example, 8 hours (480 minutes) in bed and asleep for 7 hours (420 minutes) would give us $(420/480) \times 100 = 87.5\%$

Good Sleep Quality

As we have established, not all sleep is created equal. To effectively determine if you are getting good quality sleep there are few criteria that you need to be solid on. These criteria include:

- Falling asleep in 30 minutes or less. The length of time it takes you to fall asleep is a good indicator of whether or not you need to re-evaluate the effectiveness of your sleep routine.
- Waking up for 5 minutes or less no more than once during the night. Waking is somewhat normal, although it is best if you don't. If you do wake more than once this is an indicator that you will be tired the next day because your sleep cycle was disrupted too often. Habits that cause waking up too frequently include drinking too much liquid before bed and needing to go to the bathroom, drinking alcohol, having caffeine too late in the day, and being addicted to nicotine.
- Spending 30 minutes or less getting back to sleep for that one period of wakefulness that you had during the night.

Having a good quantity of sleep (7–9 hours) with high sleep efficiency leads to good quality sleep, but something else that can aid in getting higher sleep quality is our sleeping position.