

Sleep 101

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Welcome to Sleep 101. I'm Dr. Wu, clinical psychologist and Board-certified behavioral sleep medicine specialist. This is a free resource I have developed for people who are curious about sleep or concerned about sleep problems. In this document, you will find introductory education on sleep and sleep disorders, as well as recommendations for where you can learn more.

Please note that this Sleep 101 document is only for informational purposes, and does not substitute for advice from a healthcare professional. It's also not an exhaustive nor deep dive into sleep science, but rather, a primer to help you become acquainted with the basics of sleep health.

All of the information I provide is based in scientific evidence. All opinions I express are my own. The first of these opinions: Sleep is a lovely thing, and everyone deserves to have a healthy relationship with it.

Wishing you restful sleep,

Dr. Jade

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What is healthy sleep?

Scientists are still working on understanding sleep, including defining exactly what it is. We do know that, during sleep:

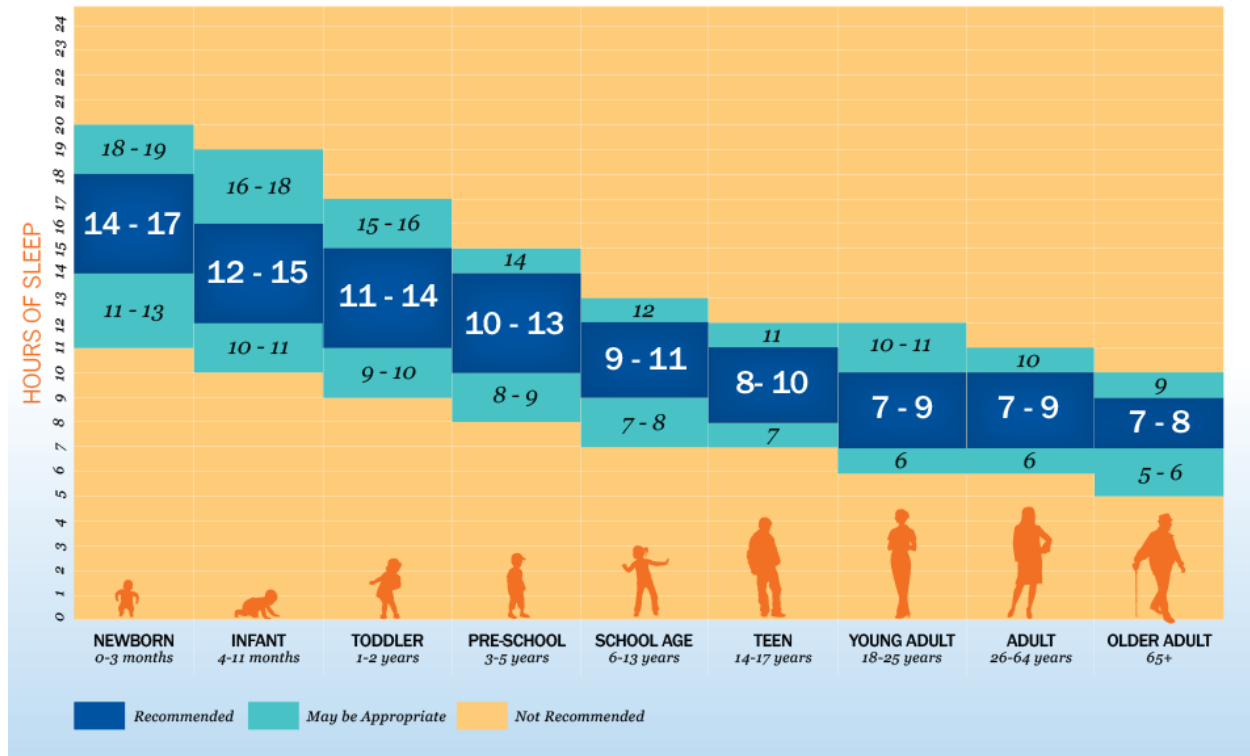
- Brain activity is different from when you're awake
- The brain and body do important things, like healing, growing, learning, and organizing

For humans, there's a big range in what healthy sleep looks like. Some people need more or less sleep than others. Some are hard-wired to sleep earlier or later than others. Some sleep alone. Some sleep socially. There is no single mould for healthy sleep.

But there are some general characteristics that apply to most:

1. Sleep duration.

The National Sleep Foundation provides guidelines for appropriate average sleep duration (i.e., how much you get per 24-hour period, on average):



National Sleep Foundation (www.sleepfoundation.org), 2015

Notice two things about these guidelines:

- **Appropriate sleep durations change over the life span.** We need less sleep as we get older, because our brains' and bodies' needs are different. For example, middle-aged adults need less time than teens to release growth hormones and sex hormones during sleep, because they are not growing as quickly and not going through puberty.
- **There is a big range in appropriate sleep durations even within age groups.** For example, most adults need 7-9 hours of sleep per 24-hour period, but as few as 6 hours or as much as 10 hours may be appropriate.

To figure out how much sleep *you* need, a good starting strategy is to keep a consistent wake-up time in the morning. You can be less strict about when

you go to bed. Instead of setting a bedtime in stone, simply go to bed when you feel sleepy (not tired, but sleepy), as long as you make sure to have some low-key wind down time in the late evening. Your body will tell you how much sleep it needs by becoming sleepy at the appropriate time.

2. Sleep timing

Generally, most of us sleep at night and wake during the day. But there is variation in when we feel the most sleepy versus awake. Our tendency to sleep, wake, and do other biological processes at certain times is called our “chronotype”:

- **Early bird chronotype.** Some are biologically hard-wired to be morning people. They tend to wake early, feel energetic in the mornings, and start to flag in the afternoons.
- **Night owl chronotype.** Some are biologically hard-wired to be evening people. They tend to hate mornings, feel most energetic in afternoons/evenings, and stay up late.
- **Somewhere in between.** Most of us are not extreme owls or larks. We generally start feeling sleepy between 10:00 PM to midnight, and feel okay waking between 6:00 AM and 8:00 AM.

There is nothing inherently good or bad about being an owl or lark or somewhere in between. But we feel best when our schedules align with our natural chronotype. For example, owls who must get up at 6:00 AM for school or work will not function or feel at their best, just as larks who are forced to stay up past midnight will be cranky and ineffective.

3. Sleep architecture

Sleep architecture refers to the “shape” and pattern of our sleep throughout a typical night. We usually experience several types of sleep (sometimes referred to as “stages” of sleep):

Stage 1 (“light” sleep)

This is the lightest type of sleep because we are easily woken from it, and sometimes may not feel like we’re really sleeping at all. That’s why it’s also referred to as “restful wake.” It takes up only about 5% of a typical night, serving mostly as a transition from waking to other stages of sleep.

Stage 2 (also “light” sleep)

Even though Stage 2 is considered “light” sleep, it is an important time for the brain. It practices what it learned during the day, so that when you wake, you’re actually better at a new task (e.g., playing the piano) than you were when you went to bed. This type of sleep takes up approximately 45%-55% of the night.

Stage 3 (“deep” sleep, a.k.a., slow wave sleep, delta sleep)

During this type of sleep, the brain engages in important janitorial work to clear toxins from the brain. It also releases growth and sex hormones and engages in general rest and restoration. Deep sleep occurs during the first half of your main sleep period, taking up about 15%-20% of a typical night.

Rapid eye movement (REM) sleep

This type of sleep is very different from the other three (collectively known as “non-REM” stages). During it, your major muscles are “deactivated,” your eyes are moving, and your brain activity looks almost like the activity you have when awake. The brain is engaging in emotional processing and memory consolidation. This is also when most of our dreaming happens. REM occurs mostly during the second half of the main sleep period (i.e., the morning hours).

Wake

Wakefulness is actually a natural and healthy part of sleep. A healthy adult (~35 - 65 years old) sleeper wakes about 10-16 times per night, though they don't remember most of these brief awakenings. It's normal to remember a few awakenings from going to the bathroom, adjusting your position, or from a dream. Don't worry that waking up “interrupts” your sleep. You're not starting a sleep cycle over or missing out on a particular stage of sleep (unless you have sleep apnea or another significant sleep disorder).

Sleep cycles

We cycle through these stages of sleep in a more or less predictable pattern from night to night. The brain moves from wakefulness to light sleep to deep sleep and to light again, and then onto REM, with brief awakenings at transition points. You may have heard that these sleep cycles are 90 minutes long, and you should try to time your wake-up to be at the end of a cycle. This is not totally accurate.

In fact, not everyone's sleep cycles have the same length, and even your own sleep cycles are not the same length during one night. You can't really control the length of your sleep cycles, and you don't need to. Your brain will actually automatically adjust how much deep sleep versus REM sleep versus light sleep you get depending on your current needs. This flexibility is a good thing! Trust your brain to know what it needs.

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Common sleep disorders

1. Insomnia Disorder

Insomnia disorder refers to having significant difficulty with falling or staying asleep for at least 1-3 months, and the sleep difficulties are affecting daytime functioning or causing distress.

Short term insomnia is almost universal. Everybody has some trouble falling or staying asleep occasionally. This can be due to stress, life changes, excitement, nighttime obligations etc. For people who persistently have trouble falling/staying asleep, chronic insomnia has usually taken on a life of its own. This means that the initial stressor is no longer the main reason for ongoing insomnia.

To learn about what might be keeping your insomnia going, and what interventions might help, you can consult with a [Behavioral Sleep Medicine Specialist](#). You can also learn more about the gold-standard treatment for insomnia, [Cognitive Behavioral Therapy for Insomnia](#) (CBT-I).

CBT-I is the first-line treatment for insomnia according to the American Academy of Sleep Medicine (AASM) because it is supported by lots of good evidence. It's effective for improving sleep for people with insomnia, it's short-term (usually 4-8 sessions), it's cost-effective, its effects last a long time, and there are minimal side effects. It is not the same thing as sleep hygiene ... in fact, we use sleep hygiene as the placebo condition in our insomnia clinical trials.

These are the books I recommend for insomnia self-help:

[*Say Goodnight to Insomnia: A Drug-Free Programme Developed at Harvard Medical School*](#)

By Gregg D. Jacobs · 2011

[*Quiet Your Mind & Get to Sleep: Solutions to Insomnia for Those with Depression, Anxiety, Or Chronic Pain*](#)

By Colleen Carney & Rachel Manber · 2009

2. Insufficient sleep syndrome

Insufficient sleep syndrome happens when you regularly don't get enough opportunity to get enough quality sleep. This might be due to family demands, work, staying up too late or getting up too early, using substances that keep you artificially awake etc. This causes cognitive impairments and mood problems, increases risk for serious health conditions, and generally makes you feel unwell.

This is very different from insomnia disorder. People who have insomnia do have enough opportunity to sleep, but they struggle to fall/stay asleep even though nothing much external is preventing them. People who have insufficient sleep syndrome *can* fall/stay asleep more if only they had more time or better conditions for sleep; their daytime symptoms are resolved if they simply get more sleep.

The trouble is that, often, people who have insufficient sleep syndrome are either not aware of their problem or not able to change their sleep-restricting circumstances. If you suspect that you or a loved one is regularly deprived of

quality sleep opportunity, you can [learn more](#) about this condition and [healthy sleep habits](#).

3. Obstructive sleep apnea (OSA)

Obstructive sleep apnea (OSA) is a serious sleep-related breathing disorder. During sleep, an apnea occurs when a person's airway becomes blocked for at least 10 seconds, which causes the oxygen level in their blood to drop, which forces the brain to wake him/her up in order to breathe. A hypopnea is a milder version of an apnea.

A person is considered to have mild OSA if they have 5-15 apneas/hypopneas per hour, moderate OSA if they have 15-30 per hour, and severe OSA if they have more than 30 per hour. In other words, a person with severe OSA stops breathing once every 2 minutes (or even more often) when they sleep.

This causes damage to the heart, brain, and rest of the body. It also feels terrible, because someone with OSA has frequent interruptions to their sleep, and may not ever get to enter deep sleep. Since deep sleep is so important for our immune systems, brain health, heart health, and overall ability to function well, OSA sufferers are at higher risk for diseases and have less ability to cope with daily challenges.

One tell-tale sign of OSA is feeling sleepy during the day. People with OSA may even fall asleep unintentionally, such as during meetings, while watching TV, or even while driving.

To see if you may be at risk for OSA, try this [screening tool](#).

Please note that OSA isn't only present in people who are men, older, or overweight, although these groups are at higher risk. There are slim women, varsity athletes, and people of all ages and shapes who have OSA, so don't hesitate to ask your doctor about getting a sleep study to assess for OSA if you're concerned.

4. Circadian rhythm sleep-wake disorders

Circadian rhythms are the network of biological clocks that run in our brains and bodies. They are essential to all aspects of physical and mental health, because if your clocks don't run on time, the machinery of your body cannot function well. Sometimes, our sleep-wake schedules do not match our body's natural, hard-wired rhythms, or there is a problem with our innate rhythms. These can show up as circadian rhythm sleep-wake disorders. Some common ones are:

Jet lag and shift-work

One of the easiest ways to mess up your circadian rhythms is to quickly cross time zones, or to work against your natural tendency to be asleep at night. Jet lag feels bad because your brain is confused by what time it is, and it must try to re-arrange all of its planned scheduling for the many complex biological processes in the body, such as metabolism, temperature changes, hormone fluctuations, energy levels, and of course, sleep and wake. This is also why it's hard to fall asleep and stay awake at appropriate times when you are jet lagged.

Shift workers may have it even worse, because they often have to switch back and forth between night vs. day sleep throughout the week, depending on which days they are working. This means that their circadian rhythms are constantly confused, which means that their bodies and brains are constantly

under-performing. This is why shift workers are at a higher risk for sleep disorders, cancer, obesity, and other serious health problems.

Even a small shift in our sleep-wake schedule could be problematic for our circadian health. This is why the annual clock changes in the U.S. for Daylight Savings Time feel so awful, and may even increase traffic accidents and negative health events.

To minimize the damage from this type of circadian shifting, help yourself to maintain a consistent rise time in the mornings. Think of it this way: If you sleep in for 3 hours on weekends compared to weekdays, you are jet lagging yourself from New York to California and back every week, or you are going through something three times worse than Daylight Savings Time twice per week.

Delayed and advanced sleep phase disorders

Sometimes, it's not changing schedules that are problematic. It's that our regular schedules don't match our body's innate rhythms. For example, someone who is naturally wired as a night owl would have difficulty getting up very early for school or work, function less than optimally throughout the day, and may have trouble falling asleep because they try to go to bed earlier than their chronotype prefers. This is called *delayed sleep phase disorder*.

The opposite can also be true. Someone can be an extreme morning lark by nature, but try to keep a conventional schedule, only to find it very difficult to stay up in the evenings and to sleep all the way until morning. This is called *advanced sleep phase disorder*.

If someone with delayed or advanced sleep phase disorder is able (and willing) to follow their body's natural schedule, their daytime problems will likely be resolved. The problem is that, often, someone with a more severe delayed sleep phase has natural rhythms that shift later and later, potentially until they're completely night-day switched.

General guidelines for milder delayed sleep phase include:

- Try to make lifestyle (or work) adjustments so that your sleep-wake schedule can match your chronotype needs as much as possible
- Keep a consistent wake-up time, even on days off (use brief afternoon napping to catch up on lack of sleep instead of sleeping in late)
- Get moving and get exposure to bright light (preferably sunlight) first thing in the morning

General guidelines for advanced sleep phase include:

- Get bright light exposure (e.g., from full spectrum bright light bulbs) in the evenings
- Avoid bright lights early in the morning
- Exercise in the afternoons and evenings, preferably outside

If these tips don't help, consult a [Behavioral Sleep Medicine Specialist](#) to learn about other treatment options, including using Melatonin (at a very specific time of day), scheduled bright light therapy, and chronotherapy. Do not try these methods on your own, because it's easy to mis-time Melatonin/light therapy dosing and make the problem worse.

Other sleep-related disorders

Other sleep-related disorders include restless legs syndrome (RLS; strong urge to move legs, especially in the evenings, that interferes with sleep),

periodic limb movement disorder (PLMD; frequent limb movements during sleep that interferes with sleep quality), REM behavior sleep disorder (RBD; acting out dreams), nightmare disorder (frequently having nightmares or disturbing dreams), other parasomnias (sleepwalking, night terrors, sleep paralysis, etc.), and narcolepsy and hypersomnia (disorders that involve excessive sleepiness).

It's common to experience rare symptoms of [parasomnias](#), nightmares, and other unusual nighttime symptoms, such as the occasional experience of sleep paralysis (waking up and not being able to move for a few seconds or minutes). But if you experience them frequently or the symptoms are interfering with your sleep quality, ask your doctor for a referral to a sleep neurologist.

If you experience restless legs syndrome (RLS), you should ask your doctor about your ferritin levels (part of your bloodwork results). Even if your ferritin levels are technically within “normal” range, it may be too low and cause RLS. You may need iron infusions if oral iron supplements and dietary changes are not enough.

Idiopathic hypersomnia (IH) and narcolepsy (there are two types, creatively named Type 1 and Type 2) are debilitating disorders. You can learn more about them [here](#). If you suspect that you may have one of these disorders, you should ask your doctor for a referral to a sleep neurologist right away.

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Sleep myths and FAQs

Sleep science is often misunderstood. In part, this is because sleep and sleep health are so complex that it's difficult for popular media, such as blogs, news articles, and even books, to do them justice. Also, talking about "sleep" is like talking about "wake"... it's such a broad topic! Even sleep specialists don't know everything about sleep, because we often focus only on one slice of the sleep science pie.

And context is important. Sleep is very individual. Asking the Internet, "How much should I sleep?" is like walking into a shoe warehouse and asking, "What shoe size should I get?" It's a lot more complicated than just size, and the answer is usually, "It depends." Not to mention that you are probably the person who can best answer the question.

This Sleep 101 resource will not be able to tell you exactly how much and when *you*, specifically, should sleep. But I will try to answer some common questions about this and other sleep topics. Let's also bust some common myths:

Myth: Everyone should sleep at least 8 hours per night.

Fact: Not everyone needs 8 hours of sleep. Just as you may need more or fewer calories than the "standard" 2000 per day, depending on your biology, environment, and lifestyle, you may need more or fewer than 8 hours of sleep. The amount of sleep you need also changes throughout your life. For adults, anywhere between 5 and 9 hours of sleep per night, on average, may be appropriate. The only way to know how much sleep you need is to see how

much good quality sleep your body is able to produce when there are no unhelpful behaviors and outside forces getting in the way.

Myth: If I have insomnia, the part of my brain that controls sleep must be malfunctioning (or I must have a chemical imbalance).

Fact: If the part of the brain that controls sleep is broken, you would have much bigger problems than insomnia! If you are able to mostly stay awake during the day, and able to sleep at all during the day or night, it means that there is probably nothing wrong with that area of the brain. There may be biological factors that made you more prone to having sleepless nights, but what maintains insomnia in the long term are counterproductive ways of thinking and acting around sleep, not brain malfunctions or chemical imbalances.

Myth: Being able to fall asleep immediately, anywhere, anytime, means you're a good sleeper.

Fact: The opposite may be true. If you are always able to fall asleep within a couple of minutes of your head hitting the pillow, and especially if this is the case during the day, you may not be getting enough sleep, or you may have a sleep disorder. This “ability” to immediately fall asleep, or being prone to falling asleep when you don't mean to (e.g., while driving, watching TV, talking on the phone etc.), is a sign that your brain craves more sleep than you are getting. If giving yourself more nighttime opportunity to sleep doesn't change this, ask your doctor about screening for sleep apnea or a circadian rhythm disorder.

Myth: I need to sleep straight through the night without waking in order to have good quality sleep.

Fact: Healthy sleepers wake up, on average, 10-16 times per night. They may not remember most of those awakenings, but it is normal to wake long enough (e.g., getting up to use the restroom) to remember several times per night. Because your brain goes through several cycles of different stages of sleep, there are plenty of natural opportunities to briefly wake up during those transitions. This does not mean that your sleep is poor quality or that each time you wake up you're "starting over" with a sleep cycle. However, if you often have significant trouble getting back to sleep, it likely feels very frustrating. Treatment for insomnia can help with this.

Myth: When I feel tired during the day, it's all because of not getting good sleep last night.

Fact: Feeling tired could be, in part, due to poor sleep last night. It could also be due to many other factors, such as stress, dehydration, boredom, chronic pain, anxiety, low mood, illness, other chronic medical conditions, side effects of medications, being sedentary, and others. We are prone to blaming tiredness on poor sleep, because that's often one of the most obvious things to look for. However, always blaming sleep for not feeling well could make you miss the real problem (say, depression). Plus, if you have insomnia, blaming sleep for your problems adds even more pressure to "perform" at night, which is counter-productive.

Myth: If I have healthy sleep, I should be sleeping like a baby (or like I did when I was ____ years old).

Fact: Sleep changes over the course of life. Newborn babies may need up to 18 hours of sleep per day, but this amount decreases as they get older.

Teenagers, on average, need 8-10 hours/night. By the time we are in adulthood, we usually need less. When we're young kids, we tend to be little energetic morning people, but we often drift towards being night owls as teens and young adults. By the time we're middle-aged or older, we tend to become larks again, just like when we were kids. Our sleep and body clocks are changing throughout our lives, and it's not realistic or necessary to sleep the way you did before. Your brain and body have different needs now, and the best way to meet those is to listen to your body instead to Dr. Google.

Myth: Teenagers who sleep until noon are lazy.

Fact: Whatever your opinion of teenagers, it is a fact that they are misunderstood on the sleep front. They are biologically wired to have late chronotypes (i.e., they are night owls by nature), and they need more sleep than adults. These two needs, together, mean that they should get to go to sleep later than what adults consider to be "a decent hour," and they should get to sleep in until much later than when their parents get up. On school days, they are forced to wake up much earlier than they should, so they are constantly sleep-deprived, which means they are less physically and mentally healthy than they could be. On weekends, the least we can do is to let them make up for some sleep debt by sleeping in until noon.

Question: If I wake up at 3:00 a.m. with a racing mind and struggle to fall back asleep, what should I do?

Answer: The keyword here is “struggle.” If you are relaxed, content, and maybe drifting in and out of sleep for a while, it’s not a big deal to just do that. If you are wide awake, feeling anxious or frustrated, and you’re starting to think about that embarrassing thing you said 5 years ago or about how this awakening will be bad for your functioning tomorrow ... then you’ll want to get out of bed and do something other than trying to sleep. There are two important reasons to do this: 1) You take the performance anxiety away by no longer trying so hard to sleep; 2) You avoid teaching your brain that the bed is an awake and frustrating place. If you do often spend struggle time in bed, you’re sure to sink deeper into insomnia. Yes, you are allowed to watch TV, turn the lights on, do chores, read etc. No, you don’t have to read something boring. Just do something to enjoy your extra “me” time.

Question: Why am I so sleepy all the time?

Answer: First, it’s important to differentiate between “sleepy” and “tired.” Sleepy is when you are nodding off, having trouble keeping your eyes open and your mind focused, and missing a few seconds or minutes of the TV show you’re watching. Tired is when you feel worn out, sore, exhausted, done with the day, unmotivated etc., but you are not actually falling asleep. Often being excessively sleepy during the day may be a sign of having sleep apnea or another sleep-related disorder (e.g., idiopathic hypersomnia). All of these are serious medical conditions that require special care, so please consider excessive daytime sleepiness to be a red flag.

Question: Do I really have to use my CPAP (or other type of PAP machine for sleep apnea)?

Answer: Yes. If you use your CPAP nightly for at least 4 hours per night, you'll significantly improve your respiratory health. More use may also improve your thinking, heart health, and vitality. Even within the first few weeks of using PAP, you will enjoy better mental health and improve your metabolic health. It's possible that you may need PAP therapy for the rest of your life, but sometimes, lifestyle and health changes (e.g., losing weight) may reduce the severity of your sleep apnea and allow you to use a less intensive treatment. Other possible treatments include dental devices, positional therapy, nerve stimulation, and surgery. Ask your sleep doctor if these may be appropriate for you.

Meanwhile, if the discomfort of using your PAP machine is stopping you from using it, make an appointment with your sleep doctor to try a different mask, machine, or setting. If it's awkwardness, claustrophobia, or low motivation that's stopping you, a behavioral sleep medicine specialist can help you to identify and overcome these barriers. Having a good relationship with your PAP machine may be more within reach than you think!

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Where to find help

It can be difficult to know where to start when you want to find help for your sleep. Generally, learning about sleep from reputable sources is a good place to start (knowledge is power!), but sometimes, getting into an Internet research rabbit hole can backfire. This is because not all information, even from good sources, applies to your situation. Sleep health is not separate from the rest of your body and mind health, so only considering sleep misses big pieces of the puzzle and may lead you astray.

Ultimately, a healthcare provider specializing in sleep, and ideally, specializing in your specific sleep issue, would be the best person to help you understand *your* relationship with sleep. They are trained in not only understanding the science of sleep, but also the art of how to apply their knowledge to your unique needs.

To learn more about sleep health:

[American Academy of Sleep Medicine - Patient Resources](#)

[Society of Behavioral Sleep Medicine - Public Education](#)

To find a sleep clinic or specialist:

[Society of Behavioral Sleep Medicine - Provider Directory](#)

[Penn Directory of CBT-I Providers](#)

[Directory of AASM-accredited sleep clinics](#)

Other ways to find sleep healthcare providers:

- Ask your primary care physician for a referral to sleep medicine. You may or may not need a sleep, depending on your symptoms and your risk level for sleep apnea.
- Your primary care doctor may also be able to prescribe a digital version of cognitive behavioral therapy for insomnia (CBT-I)
- Use your health insurance company's "Find a Provider" tool to search for a sleep doctor. Note that if you believe you have insomnia, a sleep psychologist or other CBT-I provider would be the best person to see.

Sleep self-help resources:

Insufficient sleep and insomnia are sleep conditions that can respond well to self-help. However, sleep-related breathing disorders (e.g., sleep apnea), narcolepsy/hypersomnia, parasomnias, and sleep-related movement disorders (e.g., restless legs) should be assessed and treated by a healthcare provider.

This is because insufficient sleep and insomnia are rooted in ways of thinking and acting unhelpfully around sleep that you can change, whereas these other sleep-related disorders are, at their root, not totally controllable by behavior change. (But generally improving your physical and mental health through better exercise, nutrition, social relationships, and predictable rhythms could very well help.)

For insomnia self-help, some app-based resources include:

[Somryst](#) - prescription-only digital CBT-I, easy to use and based in evidence.

[Sleepio](#) - digital CBT-I, easy to use and based in evidence.

[CBT-I Coach](#) - free and based in evidence; not as easy to follow step-by-step.

Self-help books for insomnia include:

[Quiet Your Mind & Get to Sleep: Solutions to Insomnia for Those with Depression, Anxiety, Or Chronic Pain](#)

By Colleen Carney & Rachel Manber · 2009

[Say Goodnight to Insomnia: A Drug-Free Programme Developed at Harvard Medical School](#)

By Gregg D. Jacobs · 2011

Informational books about other sleep disorders include:

[The Nocturnal Brain: Nightmares, Neuroscience, and the Secret World of Sleep](#)

By Guy Leschziner · 2019

If you want to scare someone into taking sleep seriously because they deprive themselves of sleep on purpose or they refuse to get assessed for sleep apnea (and they do NOT have insomnia):

[Why We Sleep: Unlocking the Power of Sleep and Dreams](#)

By Matthew Walker · 2017

*But beware of exaggerations and selective storytelling about sleep science; not recommended for those with insomnia.