

## **The Magical Power of Sleep**

What do the Exxon Valdez, the nuclear meltdown at 3-mile island, the explosion at Chernobyl, and the deadly gas leak at Bhopal, all have in common? Each accident is directly linked to sleep deprivation and the subsequent human errors in judgment. Anyone who has spent a night or two with only a few hours of sleep understands the consequences of poor sleep. However, how many of us make “sleep” a top priority in our lives? I have always appreciated quality sleep, but in researching this course, I have discovered I wasn’t giving sleep the deserved level of importance. I do now! By the end of this course, I hope you will also appreciate the absolute importance of sleep for our physical and mental health, longevity, and overall quality of life.

### **The Trinity of Health: Sleep, Nutrition, & Exercise.**

The foods we eat and our daily level of exercise have a significant effect on the quality of our health. However, an argument can be made for sleep being the most important since even 1-2 nights of poor sleep can have wide-ranging negative effects with both physical and mental impairments. Not exercising or eating poorly for 1-2 days will not have the same deleterious effects on our health. Sleep has often been undervalued in our modern, always on the go lifestyles. Many people often brag about not needing more than about 5 hours of sleep a night. And although there is a very small percentage of people where this is true, many others are just fooling themselves and sacrificing their present and future health.

### **Symptoms of poor sleep**

The most common and obvious sign of poor sleep is being constantly tired. However, there are many additional symptoms of poor sleep that we may not readily connect to our sleep but probably should. Although many factors play a role in the following symptoms, sleeping less than 6-7 hours per night is a major contributor and needs to be addressed.

- Poor memory, retention, and forgetfulness. One of the main functions of sleep is to help with learning, creativity, and consolidating memories. Although memory loss and difficulty learning new tasks increase naturally with the aging process, poor or fragmented sleep could be accelerating the process.
- Lower immune system function resulting in more sickness and higher infection rates
- Longer healing times from injury. When we sleep is when we heal. Less time sleeping means longer healing times.

- Weight gain. In response to sleep deprivation, our body increases the release of the hunger hormone, ghrelin, often resulting in overeating.
- Poor physical performance, lower libido, and difficulty increasing strength. Lower levels of both testosterone and growth hormone have been linked to poor sleeping.
- Hypertension (high blood pressure), increased risk of cardiovascular disease, congestive heart failure, and stroke. Our central nervous system shifts to a sympathetic tone (fight or flight) when chronically tired. Prolonged exposure to sympathetic tone has a deleterious effect on our cardiovascular system.
- Increased risk of Alzheimer's disease. Alzheimer's disease is associated with the buildup of a toxic form of a protein called beta-amyloid which forms plaques with the brain. These plaques are poisonous to neurons and can kill surrounding brain cells. During deep sleep, the brain appears to "wash away" these waste products and "cleanse" the brain. Therefore, poor sleep patterns can lead to an ineffective washing of the brain.
- Increased risk of diabetes by poor glucose (blood sugar) management and increased hunger.
- Difficulty controlling your mood and emotions
- Increases risk of certain types of cancers. Probably due to the rise in chronic levels of inflammation secondary to the constant state of sympathetic tone. The World Health Organization has linked shift work as a "possible carcinogen" due to the potential negative side effects of disrupted sleep patterns.

Bottom line: The shorter your sleep, the shorter your life!

### **Key factors that have fundamentally changed the way we sleep**

1. Constant light exposure at any time of the day
2. Temperature-controlled rooms and houses
3. Caffeine. Most commonly used and abused stimulant in the world.
4. Modern society's work schedules/shift work

Artificial evening and nighttime light can masquerade as "insomnia". Artificial light has been shown to suppress the release of melatonin, the hormone responsible for making us feel sleepy. Even exposure to 8-10 lux of light has been shown to lower melatonin levels. To put this into context, even a small bedside lamp may produce between 20-100 lux. Make your home as dark and "cave-like" as possible after sunset. Over a third of our brain is dedicated to processing visual information, much more than any other sense. Use blue light blocking settings on your phones and computers, limit the use of devices in the evening as much as possible, limit caffeine to the morning hours, and try

to lower the temperature in your room to about 65 degrees Fahrenheit when trying to sleep.

### **Natural Circadian Rhythms**

All living organisms on this planet have a natural 24-hour cycle that relates to wakefulness and sleepiness. All cells work on this 24-hour circadian rhythm for daily functions including coordinating digestion, moods, feelings of hunger when hormones are released, adjusting your core body temperature, and more.

The main way our bodies (and all living organisms) sync our circadian rhythms is through exposure to sunlight. Even on a rainy, cloudy day, there is enough sunlight to reset our “internal biological clocks”. This is one of the main reasons we advocate an early morning walk of 15-30 minutes daily to reset our suprachiasmatic nucleus or “master clock” that then syncs all of our bodily functions. Our bodies work the best when we are in sync with our natural rhythms. However, our modern lifestyle is often at odds with our circadian rhythms. This can result in poor sleep, sickness, disease, and a shorter lifespan. We would all be better trying to live *with* versus *against* our natural, biological rhythms. Although not as powerful as sunlight exposure, exercise and timing of food intake are also factors in helping to regulate our 24-hour circadian rhythms. More on the influence of food and exercise when we talk about minimizing the effects of jet lag on circadian rhythms.

Ironically, getting quality sleep on a daily basis actually starts the first thing in the morning. Let me explain. In a perfect world, we are all getting outside during the first 1-2 hours of early morning, low-angle solar rays for about 15-30 minutes. When the sun is low on the horizon, the blue light emitted is absorbed through the retina, activating neurons called the melanopsin cells, which in turn, communicate with the suprachiasmatic nucleus that resets our circadian rhythms and gets our bodies ready for the day. It is also now that the body starts a “timer” to release melatonin (the hormone that makes us sleepy) in about 12-14 hours after bright light exposure.

By the end of the day, our retinas have become very sensitive to bright light. This means even small amounts of artificial light after sunset can affect our sleep by suppressing the sleep hormone, melatonin. But once again, mother nature has a solution! Around sunset, going outside again for 15-20 minutes will help to desensitize your retina’s making them less reactive to bright lights in our house. This will minimize the negative effects of artificial light on melatonin suppression.

Besides the 24 hours circadian rhythm, there is another force governing our sleep/wake cycle and this is “sleep pressure”. This “sleep pressure” is caused by adenosine, a chemical in your brain that accumulates in greater levels as you stay awake longer. Adenosine is like a timer that starts when you wake up and slowly builds as the day goes on. Usually, 12-16 hours after you have been awake is the greatest level of adenosine and the subsequent highest levels of “sleep pressure”.

How can we block the sleep pressure from building? Enter caffeine. Caffeine is the world's most used and often abused, stimulant. Caffeine basically blocks the adenosine receptors in the brain, not allowing adenosine to “park” there. So caffeine makes you feel more alert by blocking your body's natural adenosine accumulation. The half-life of caffeine is 6 hours, meaning 6 hours after you ingest caffeine, half the amount is still present in our system. Also, decaffeinated coffee can have some caffeine in it. Coffee needs to be 97% caffeine-free so you are still getting about 3% of the caffeine. Based on how sensitive you are, it could be a factor. The jolt of caffeine does finally wear off as an enzyme found in the liver slowly starts to break down the caffeine. Then be ready for the “crash”. Remember, the adenosine levels have continued to build and will now come rushing in to fill the newly vacated receptors causing a great sense of fatigue and sleepiness. Caffeine should be restricted to the morning hours if you have trouble sleeping.

Are you getting enough sleep? A few simple questions to ask yourself:

1. Do you feel well-rested when you wake up? If you answer “no”, then you are not getting the quality of restorative sleep you need.
2. Are you tired again by 10 or 11 am? If “yes”, then you may be carrying a “sleep debt” from the previous day.
3. Could you make it until noon without caffeine and still function at a high level? If you can't, then you are probably self-medicating your chronic sleep deprivation.

Remember, there are over 100 sleep disorders that have been identified. If you have tried everything in your power to improve your sleep and still suffer from chronic fatigue or mental confusion, you will need to consult with a sleep specialist.

### **The physiology of sleep cycles simplified**

We have 2 types of sleep, REM sleep (rapid eye movement) and Non-REM sleep. There are 3 stages of Non-REM sleep, stages 1-3 represent a gradual progression to deeper sleep. Stage 3 is the deep sleep you require to feel refreshed and restored in the morning. We cycle through REM and Non-REM sleep multiple times per night.

### **The importance of REM sleep:**

The first REM cycle usually occurs about 90 minutes after you have fallen asleep. REM sleep can last between 5 and 30 minutes at a time and can occur every 90-120 minutes during a sleep cycle. This is where most of your dreaming occurs. Your arms and legs actually become temporarily paralyzed so you don't act out your dreams. Although we may not remember our dreams, everyone does dream about 2 hours per night and they have very specific functions. REM dreaming helps us to process emotionally difficult and stressful situations that occurred during the day, offering emotional resolution when we awake the next morning.

There are regions of your brain whose job it is to read and decode the value and meaning of emotional signals, especially faces. Accurately reading the emotions of others to make critical decisions is a valuable tool we utilize daily. REM sleep also plays a role in the recalibration of this brain center.

As we age, REM sleep naturally decreases. Alcohol before bed also decreases the amount of time we spend in REM sleep. Additional substances that can reduce our quality of REM sleep include narcotic pain medication, marijuana, caffeine, antidepressants medications, and lithium.

### **Are sleeping pills safe to take long-term? Optimize Biology before Pharmacology**

Approximately 10 million Americans are taking sleeping pills on a regular basis. However, sleeping pills are not designed to be taken long-term (greater than 3 months) and can have serious health side effects. "Medicated sleep" and "natural sleep" are not the same. "Medicated sleep" does not provide the restorative and cleansing qualities of "natural sleep". To simplify matters, sleeping pills are sedatives that make you sleepy but can become addictive. Meaning that if you ever tried to stop taking them, you may suffer even far worse sleep than you did before you started taking them. You then enter this vicious cycle and often quickly resume the same pills that are causing the symptoms in the first place.

### **Side effects of sleeping pills**

Less of the “natural sleep” that we require to consolidate memories. Long-term use may affect learning capacity and memory ability. Considering the normal age-related changes to long-term and short memories, taking sleeping pills regularly can have deleterious effects on seniors. Studies demonstrate that long-term use of sleeping pills has been linked to early mortality, higher rates of infections, and increased risk of developing cancer.

Instead, try [Cognitive Behavioral Therapy for Insomnia](#) before you reach for the sleep aids. You may need to talk to your doctor about finding a certified therapist in your area to work with long-term. Your sleep hygiene routine (page 291)

### **Are current-day humans sleeping as we should?**

Unfortunately, our modern lifestyles do not allow us to sleep as we have for millions of years. In most developed countries, we have become “monophasic” sleepers: one single long bout of sleep per day, usually around 7 hours. However, when traditional hunting and gathering cultures have been studied, they tend to be “biphasic” in their sleeping: one long, 7-8 hours of sleep at night, followed by a second 30-60 minute nap in the afternoon. All humans have a hardwired, built-in dip in alertness in the early afternoon. Think about those after-lunch meetings and how hard it is to stay awake. Adopting a biphasic sleep pattern has, not surprisingly, been linked to improved health and longevity in research studies. Finally, a scientific reason to take that afternoon siesta! Elizabeth has posted some great information on “[Yoga Nidra](#)” or Yogi sleep that has been shown to help reset our nervous system, reduce stress and anxiety, and promote a sense of well-being. [Check it out now](#)

### **Sleep patterns in midlife and beyond**

It is not a surprise to anyone over the age of 50 that sleep has become more challenging. Medications, urinary changes, hormones, pain, and lower melatonin levels are all contributors to our irregular sleep patterns. Our circadian rhythms that govern our wake and sleep cycles tend to weaken as we age. This is one reason why elders tend to wake up earlier and also go to sleep earlier as they advance in age. Our melatonin production also reduces as we advance in age and supplementation may be an option. Please consult your physician before starting any supplements or new medications.

Many seniors do not equate their poor health to issues with their sleep. Although not all age-related health issues are due to poor or fragmented sleep, many underlying issues

are exacerbated by chronic sleep deprivation. Therefore, sleep quality needs to be a discussion at every doctor's visit as we advance in age.

### **The Alcohol and sleep myth:**

Many people use daily alcohol as a “sleep aid”. While it is true that alcohol is a sedative, it does more harm than good to your quality of sleep. The half-life of alcohol is about 4-5 hours. In simple terms, this means the amount of alcohol you consume now will only be 50% processed in 4-5 hours. Using a nightly alcoholic drink to “help” you sleep is not a great idea.

But what about the social factor of alcohol? People tend to “liven” up a bit with moderate alcohol. Since alcohol is a sedative, the region of the brain it affects first is the prefrontal cortex. The role of the prefrontal cortex is to restrain our behavior and help to control our impulses. So as it becomes impaired with alcohol, we tend to “loosen up” a bit. As the effects of alcohol continue to sedate other parts of the brain, we tend to feel groggy and appear to want to sleep. However, this is not the same as “natural sleep” and, in turn, does not provide the health benefits of sleep. Alcohol has also been linked to less REM sleep and an increased chance of sleep apnea.

Alcohol-induced sleep tends to lead to a fragmented sleep pattern resulting in brief awakenings throughout the night. This is not restorative sleep so you often wake up without feeling rested. However, we are often not aware of these brief awakenings throughout the night and, therefore, do not equate our sleepiness the next day to our alcohol consumption the night before.

### **Tips to improve your sleep hygiene**

1. Stick to a regular sleep schedule, even on the weekends. Even 1-2 hours of staying up later on the weekends can lead to a “social jet lag” that may take you until mid-week to feel 100%.
2. Getting bright light exposure first thing in the morning is critical to help set your circadian rhythms. Ideally, you are outside within 1-2 hours of sunrise for up to 30 minutes. Even on a cloudy day, you are absorbing enough lux to reset your circadian rhythms for the day.
3. Set an alarm for *bedtime*, make sleep a priority in your life.
4. Exercise for at least 30 minutes daily, preferably in the morning. If you do exercise in the evening, try not to vigorously exercise at least 2-3 hours before bedtime.
5. Avoid caffeine and nicotine. Caffeine has a half-life of 6 hours. This means that if you have an afternoon cup of coffee at 2 pm, half the amount of caffeine is still in your system at 8 pm. Nicotine is a stimulant that can interfere with your natural sleep patterns.

6. Avoid alcohol before bed. Although a sedative, alcohol has negative effects on sleep. The half-life of alcohol is about 5 hours. So half the alcohol of your after-dinner 9 pm glass of wine will still be in your system at 2 am in the morning. Alcohol can also contribute to nighttime urination.
7. Try to have your last calories (both food and drink) at least 3 hours before bed. This will give your digestive system to process the food and help you sleep better at night. Sleeping on a full stomach is difficult as the body now needs to focus on digestion and absorption.
8. Avoid high glycemic foods late at night. Examples of high GI foods (anything that will spike blood sugar levels) include white bread, white flour, potatoes, and bananas. The glycemic index is a value assigned to foods based on how slowly or how quickly those foods cause increases in blood glucose levels. Foods low on the glycemic index (GI) scale tend to release glucose slowly and steadily. Foods high on the glycemic index release glucose rapidly
9. Check with your pharmacist or physician to make sure that any medications you may be taking are not interfering with your sleep. You may need to take certain medications at different times of the day.
10. No napping after about 3 pm. If you nap, try not to sleep for more than 60 minutes. Even if you are not tired enough to nap in the early afternoon, just relaxing for 15-20 will re-charge you for the next half of the day. [Yoga Nidra or Yogic sleep is a great option for a midday pressure release.](#)
11. Take the last hour before bed to relax and unwind, preferably without your electronic device. If you do need to be on your device, make sure it's on a setting that will block blue light emissions that can suppress melatonin.
12. Keep your room as dark as possible. Wear an eye cover to keep out ambient light from street lights or electronic devices.
13. Keep your bedroom cool, around 65 degrees Fahrenheit if possible.
14. Keep your bed for only 2 activities: "Adult recreation" and sleep. Not for watching TV, staring at your phone, crafting, etc. If you find yourself unable to fall asleep after about 20 minutes in bed, get up and do some relaxing activity until you feel sleepy again. Just don't start watching Netflix or stare at your phone.
15. Melatonin production, the hormone responsible for making us feel tired, reduces as we age. Consult with your physician first to see if taking a melatonin supplement would be good for you.

## Reduce the effects of Jet lag

Having parents who live in India, I make the trip (non-covid times) usually 1-2 times per year. Not a big surprise, but as I get into my 50's, it takes me much longer to adjust to the new time zone. However, I have been more scientific about my travels which have helped significantly. Jet lag has 2 components-travel fatigue and changing of time zones. We usually take 1 day per hour of time change to readjust our circadian rhythm. Preparing before you go can make a huge difference (jetlagrooster.com will lay out a plan) Let's work through a simple example.

To help your circadian rhythms to quickly adjust to your new time zone, we need to determine our "Temperature Minimum". Your temperature minimum occurs about 2 hours before you wake up. Assuming you wake up around 6:00 am daily, your temperature minimum occurs at around 4:00 am.

If you were flying from Seattle, Washington (Pacific Time Zone) to New York City (Eastern Time Zone), there would be a 3 hour advance of your time zone. If your normal bedtime back in Seattle is 10:00 pm when you get to the east coast and it's 10:00 pm local time, your biological clock or circadian rhythm thinks it's only 7:00 pm making going to sleep very difficult. Our biological clocks can only adjust about 1 hour per day to a new time zone. Therefore, if you didn't prepare ahead of time, it would take you 3 days to adjust to the new time zone. If you wanted to minimize your jet lag, you would start to "phase advance" your 24-hour circadian rhythm before you left Seattle.

Knowing that bright light helps to sync our biological clock, you should try to get as much bright light as you can for the first hour after your temperature minimum (4:00 am in this example). So for a few days before you leave, start to wake up about 1-2 hours earlier, get plenty of bright light, do some early morning exercise, and eat breakfast. This way you will already be adjusted to your new time zone the moment you get there!

Research shows that light exposure and melatonin can reduce the side effects of jet lag. Using a portable lightbox of around 10,000 lux when bright light is indicated and talk to your doctor about short-term melatonin supplementation to help you adjust to your new time zone. Additional tips include:

1. Get light exercise when you arrive at your destination. This helps to normalize your circadian rhythms.
2. Avoid stimulants on the plane: caffeine, alcohol, or nicotine. Stimulants alter your central nervous system, further negatively affecting your circadian rhythms.

3. Take melatonin to help you fall asleep in your new time zone if you are not naturally tired. Dosage parameters are between .5 mg and 5 mg. Remember to consult your physician first.
4. Hydrate on the plane. Try to get 1 glass every hour of fly time.
5. Consume curcumin. Curcumin, found in turmeric, has been shown to help reduce levels of inflammation. Crossing multiple time zones creates “stress” in our bodies. This in turn results in an increase in systemic inflammation. Taking about 1,000 mg upon landing at your destination will help.
6. Remember, light exposure (or lack of), exercises, and timing of food intake all help to reset our circadian rhythms.

### **Summary**

I hope by now I have laid out a convincing argument as to why you should make quality sleep your number one priority. We need to get back to the basics: good quality sleep, eating the right foods, and daily exercises. No one is perfect, but even if we strive for a 10% improvement in each area, the compounding effects can be significant. Remember to try and optimize your biology first before you resort to pharmacology. We don't want to just be treating symptoms when we can get to the cause. Here's to good sleep!

Best,

Ed