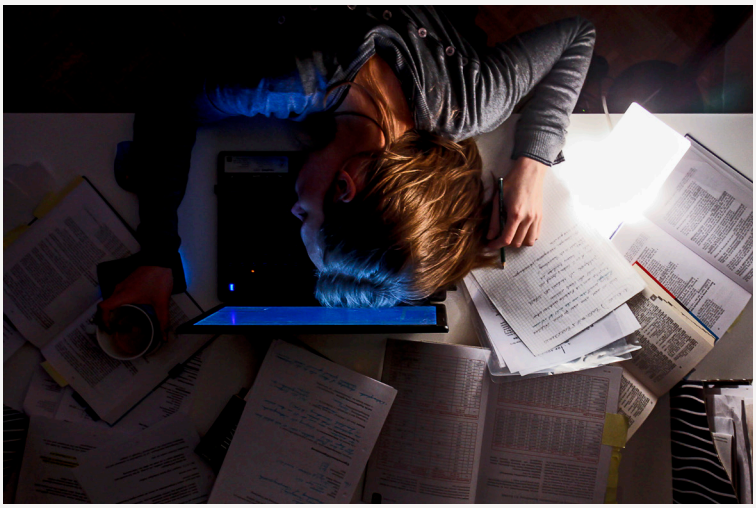
Center for Creative Leadership®

The Care and Feeding of the Leader's Sleep



"We are not wired biologically for sleep deprivation. We're the only animal that intentionally sleeps less than we need to."

~Van Cauter, a sleep researcher

A few years ago, I did some work with the Navy's NFOT program. NFOT stands for new flag officer training, a two-week program for newly minted one star admirals. It took place in a secluded retreat center in West Virginia. As part of the program various high-level speakers would come in and speak on topics such as military strategy, most of which were way above my pay grade and comprehension. Their use of acronyms was impressive. Even though they were speaking English, it might as well have been Chinese. I was the lowly fitness consultant trying to educate these officers on the value of eating well and staying fit.

One of the speakers that was helicoptered in was the Chair of the Joint Chiefs of Staff. Yes, this was the guy at the top of it all. I was fortunate enough to attend his talk. He was interesting, relaxed and something of a departure from the typical PowerPoint heavy, dry military speak. At the end of his talk he opened it up for questions.

One question that was posed was, "Sir, what keeps you up at night?" Of course, everyone was quite keen to hear what the most powerful military man in the country would say. There was, after all, a lot of bad stuff going on in the world. His response, however, was one I will always remember. He said, "Actually, nothing keeps me up at night." Wow, how is this even possible? A lot of things happen to keep me up at night that have nothing to do with world peace or fending off terrorist attacks. Yet here was THE TOP GUY claiming that he slept like a baby.

Thankfully, he followed up with an explanation. "First", he said, "the reason that nothing keeps me up at night is because I go to bed knowing I did the best job that I could, that there was nothing more that I could've done that day. Secondly, sleep is very important to me, because without it, I wouldn't be able to do my job."

What was somewhat ironic is that the nickname for the admiral in charge of the NFOTS program was "Admiral Whitespace". This was a bit of fun sarcasm in that there was literally no whitespace in the two week schedule (with perhaps the exception of Sunday afternoon and even then there were activities on offer). The officers were literally up at dawn and in meetings until 10 at night. Their sleep, evidently, was not a consideration at all. In fact, lack of sleep is often something of a badge of honor in the military (although I don't think this is unique to the military). But if the chair of the Joint Chiefs thinks sleep is important, perhaps that will change.

This is the catch-22 that we find ourselves in this day and age. Most would agree that sleep is critically important for health, productivity and good brain function. Yet, most work cultures do not support good sleep. It is easily swept aside in the current business world where the demands on a leader's time are high. There are never enough hours in the day and the cycle of business never stops. Additionally, in many organizations there is a workplace warrior culture where getting by on little sleep is rewarded and admired. We acknowledge sleep's importance, but we don't create routines, work habits or cultural norms to support it.

Yet lack of sleep is costly. It can compromise safety, productivity and long-term health. Poor sleep interferes with cognitive function, such as memory, attention and the ability to make connections. It erodes creative problem solving, self-awareness, energy and interpersonal savvy—all attributes that are important for leadership.[1]

This erosion in cognitive performance can happen without us really realizing it. A 2003 study found that subjects reported being more fatigued the first few days after reduced sleep. But, by day four, they had adapted to a new baseline level of drowsiness and reported feeling fine—even as their cognitive performance continued to go down.[2]

Short sleep duration has also been linked with 7 of the 15 leading causes of death, including cardiovascular disease, cancer, strokes, accidents, diabetes, septicemia, obesity and hypertension.[3]

So what is the current state of sleep among leaders? Do they tend to get less than others? Is shortened sleep time necessary or normal in order to be at, and stay at, the top? What are the health, leadership and performance consequences of getting less than optimal sleep? And finally, what are some practices that can be implemented to ensure better sleep? These questions will all be explored in this paper.

Sleep is a tricky thing to study.

Most sleep studies are observational in nature. It is unethical, for example, to impose sustained sleep deprivation on subjects, even if it is for the sake of science. Other limitations include self-reported sleep, problems of over or under adjustment, single sleep measurements, and difficulty in taking into account changes in sleep habits over time. Additionally, we can't be sure that it is the shorter sleep per se that increases risk, or whether these effects are also driven by the increased amounts of waking activities (which aren't always healthy in nature, like eating more calorie rich foods).[4] Nevertheless, in spite of these limitations, the data are compelling. Poor sleep habits come at a cost to health, productivity and leadership capability.

The Current State of Sleep in Leaders

"I have miles to go before I sleep"

~Robert Frost

Research by the Center for Creative Leadership has found that, while most leaders would like to get more sleep, many struggle to get enough.[5] The average sleep debt (or the difference between the sleep they need and the sleep they got) was 53 minutes, with women reporting a higher debt than men (68 min vs. 39 min). Night owls, that small percentage of people who tend to be more alert in the evenings, reported a much higher sleep debt of 71 minutes. This makes sense as standard working hours assume that productivity is optimized in the morning and during the day. The current work structure is not set up to help night owls work when they are at their best, later in the day.

With regard to what interferes with sleep, women were more likely to report psychological interference with sleep, such as stress or thinking about work issues, whereas men reported slightly more physiological problems, such as sleep apnea.

However, total sleep time in this population suffered mostly due to long days and busy, activity-filled lives. There just aren't enough hours in the day to get it all in, i.e. working long hours and then trying to spend quality time with the family, complete household chores, and exercise. Given these demands, sleep is often the first to be sacrificed.

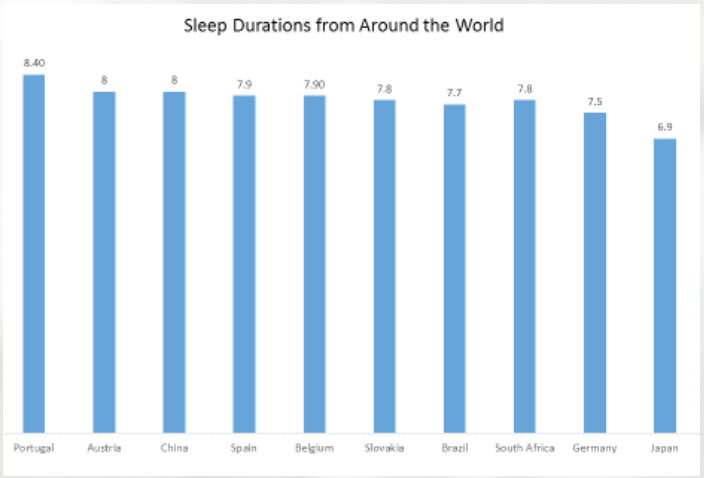
An additional impediment to sleep, even more so than lack of time, were work issues and difficulty in being able to psychologically detach from work (even after controlling for factors like age, exercise and other lifestyle factors).[5] Oh that we could all be like that chair of the joint chiefs where nothing keeps us up at night!

Before discussing the impact of sleep on health and performance and ways to enhance sleep quality and duration, it is helpful to understand what happens when we sleep and its physiological roots.

Sleep Around the World

In March of 2017, Royal Philips released its finding on how people from five countries (U.S., Netherlands, Germany, France and Japan) perceive, prioritize and prepare for sleep.

Over 92% from across all countries said that sleep is crucial to their health and general well-being. Yet 84% said that there were other things in their life (like family time, work and watching TV) that took priority over sleep. Slightly more respondents from the U.S. reported that working late (like sending out late night emails) showed that you care more about your job, while more respondents from France said that spending time with family was more important. Nearly half said that looking at a screen, be it a TV, computer or mobile device, was the very last thing they did before they slept.



Another study looking at sleep habits from 10 different countries found that the average sleep time was 7.6 hours, with the lowest in Japan at 6.9 and the highest in Portugal at 8.4 hours. Typical bedtimes were between 10 p.m. and midnight, with South Africans going to bed the earliest at around 10 p.m. (they also got up the earliest) and those in Portugal and Spain going to bed the latest, midnight. Average times for getting up were between 6 and 7 a.m.[6]

The Physiology of Sleep

"Laugh and the world laughs with you, snore and you sleep alone"

~Anthony Burgess

Stages of Sleep

Throughout the night we go through various stages of sleep. These stages are believed to play different roles in physical recovery and maintenance of brain health and function.

Stage 1 is when we first enter into sleep. It is that time when you are half asleep, so to speak. You still have some awareness of your environment, but that awareness is starting to slip away. If you have ever had that sensation of falling and you suddenly jerk awake, it is during this stage that that can happen. This stage lasts about 10 minutes.

Stage 2 marks the beginning of sleep. Here you completely disengage from your environment and there is a lack of movement. This stage lasts for 10-20 minutes.

Stages 3 and 4 are the deep sleep stages. During these stages, relaxation is complete and your blood pressure and pulse drop. Deep sleep is important for restoration and growth. Your core temperature also drops, your metabolism slows down and it is a time when your immune system gets an important boost. In general, declarative memories—a type of long-term memory that helps us remember conscious events--are enhanced by this deeper sleep.[7]

After you have reached stage 4, you cycle back to stages 3 and 2, and then into REM sleep. REM sleep is when your brain is the most active and when you are more likely to dream. After a period of REM sleep, you then cycle back into the deeper stages of sleep, then back out again. Each cycle of REM and deep sleep is around 90 to 110 minutes, so during the night you will ideally get in about 4-5 of these cycles.

As the night goes on, you will spend less time in deep sleep and more time in REM sleep. It has been suggested that, if you need to wake up early, to time your wake-up during your REM or lighter sleep, i.e. at the end of a cycle, rather than during the middle of a cycle when you are in a deeper sleep.

Similar to a computer, REM sleep helps you get rid of unnecessary clutter that can drag and slow down the system. You also need to file away stuff that is important to remember. REM sleep is critically important for memory and learning.[7] After intensive periods of learning REM activity increases. When sleep is disrupted, the brain's ability to transfer short-term memories into long-term memories is impaired.[8]

Aligning the Circadian and Homeostatic Systems with External Cues

The word circadian means around (circa) the day (diem) and is our built-in 24-hour clock. This is regulated by the suprachiasmatic nucleus (SCN), a small group of nerve cells found in the hypothalamus of the brain. The circadian rhythm continues to function in the absence of external cues, such as light. Thus, if you were to live in a cave without any light, you would, on average, still sleep around 8 hours and be awake for 16 hours.

Yet the SCN is affected by light exposure. Light signals the hypothalamus and corresponding organs to be alert and to wake up. This triggers your body to produce optimal levels of daytime hormones and neurotransmitters that help to keep you alert and energized (e.g. cortisol).

This has important implications for a number of reasons. Too little light exposure upon waking, as well as during the day, can lead to daytime sleepiness (or less alertness) and poorer sleep at night. Too much light during the evening can also lead to poorer sleep.

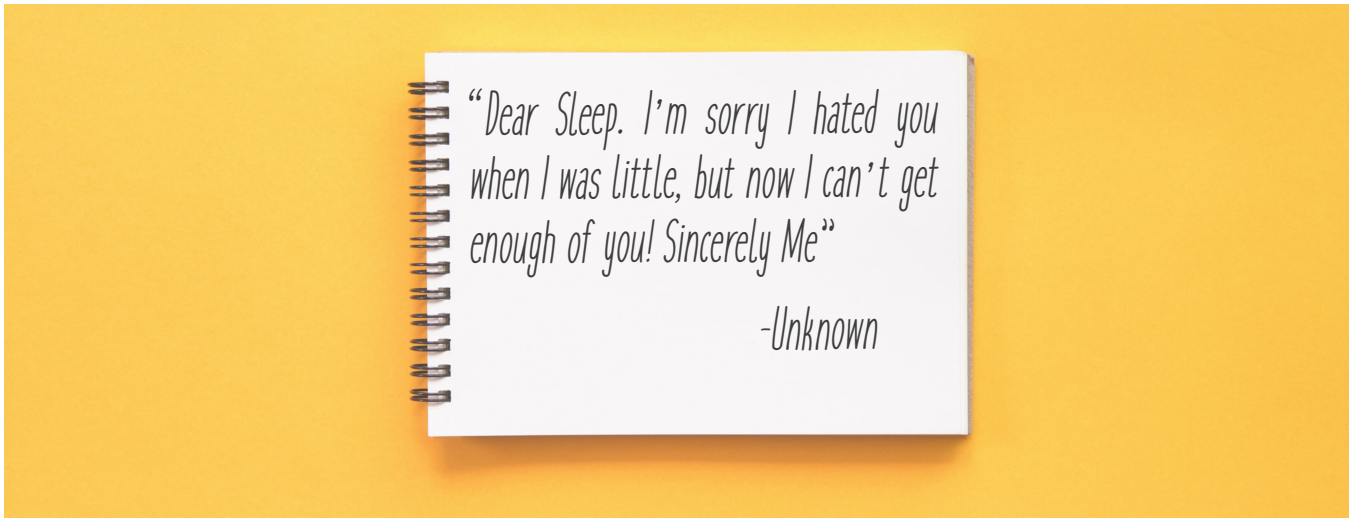
The other problem is when the timing of the external cues doesn't align with the internal body clock. This is called either jet lag or social jet lag. Social jetlag is when you stay up later and sleep in later on the weekend as compared to during the week. When it comes to our circadian rhythm, it doesn't know the difference between a weekday and a weekend.

Of interest is that more than 70% of humans have an internal circadian clock with a period that is greater than 24 hours, or is 24.2 hours on average. Thus, for many people, the internal clock takes more than 24 hours to complete one cycle which results in a tendency for "phase delay" or a drift towards later sleep times over time. To remain in sync to the external 24-hour day (and a 9 to 5 society), the circadian clock needs to regularly, if not daily, shift earlier.

The biggest influence on this is light exposure.[9] As discussed later in this paper, morning light exposure (preferably between 6 and 8:30 a.m.) is when we are most responsive and which has been shown to be beneficial to sleep.

The homeostatic system is your body's attempt to balance wakefulness with sleep. This is a bit of a push and pull system. As wake time increases, so does sleep pressure. Thus sleep pressure is lowest early in the day and will build into the evening. Sleep deprivation increases the sleep drive during the day resulting in daytime sleepiness.[10]

Evidence of sleep deprivation can be seen all too often. For example, how many times have you boarded a flight



and half the people are already nodding off? Or how many times have you been in an afternoon meeting or presentation and you see people fighting (and sometimes losing the battle) to stay awake. People do not fall asleep in meetings because they are bored or because they just ate a big lunch. No, they nod off because they are sleep deprived. The good news is that next time you are giving a talk and someone nods off, don't take it personally. It isn't because you are boring (well, maybe you are) but because they are sleep deprived. It is their fault, not yours (although being boring is still your fault).

When these circadian and homeostatic systems get out of sync, which is easy to do in this 24-7 culture, it is understandable how chronic sleep problems can be created.

Central to our sleep/wake cycles are two hormones; melatonin and cortisol.

Melatonin and Cortisol: the sleep/wake hormones

Melatonin is produced by the pineal gland and other tissues in our body. It is secreted naturally as it gets darker outside, i.e. it begins to increase 2-3 hours before habitual bedtime.[11] It doesn't really put us to sleep per se, but helps to create ideal conditions for good sleep, such as lowering our body temperature. Melatonin production can decline with age, which is one reason why we can experience more sleep problems as we age.

Cortisol, on the other hand, increases in the morning and in response to light. Ideally it should decrease in the evening. It basically has the opposite cycle to melatonin. Thus if your light cues (as well as other cues) are off (too little light in the morning, too much at night) these cycles get disrupted, e.g. cortisol stays high in the evening and melatonin is suppressed, compromising sleep AND productive daytime performance.

The Sleep Gate

About six hours before our lowest body temperature (which occurs at around 2-3 a.m.), we enter a 3-hour period called the "sleep gate." Studies show that we will sleep longer (and better) when we start sleep within this sleep gate time period (for most people this is between 8-10pm). It's difficult to fall asleep before the gate opens, e.g. before 8 p.m.—a period called the "forbidden zone", and it can also be hard to fall asleep after the gate closes (in this example, that would be after 10 p.m.).[12] An example of this is if you've been sleepy but you get caught up in reading a book, watching a show or answering emails such that you push past your normal bed time and the closing of this sleep gate. Then, when you do turn out the lights, you are now wide awake and have difficulty falling asleep, in spite of being sleepy earlier.

How Much Sleep is Healthy?

"The best cure for insomnia is to get a lot of sleep" ~WC Fields

"When viewed as an ecosystem, of either preparedness or unpreparedness, it becomes clear that sleep loss and circadian disruptions impact competitive edge." ~Fatigue Science in the Science of Sleep

This question has been of primary interest to those involved in sleep research. Yet, proposing a "healthy amount of sleep" is complicated, both due to the limitations of studying sleep and the likelihood that there are large inter-individual differences in sleep need. The 7-9 hour recommendation doesn't apply to everyone as certain people likely have a genetically determined lower or higher sleep need. As pointed out by one author, "there also has to be some flexibility in the timing of sleep in the sense that humans can cope with one or single nights of reduced sleep relative to their individual needs without relevant consequences for daytime alertness or performance."[4]

Yet, the 7-9 hours recommendation is not without merit. In one study researchers compared sleep durations of 4, 6 and 8 hours for a period of 14 days under strictly controlled conditions. They found significant cumulative, and dose-dependent deficits in cognitive performance in those who only slept 4 or 6 hours.[2] In other words, the less sleep people got, the greater the drop in brain function. Subjects were also largely unaware of their increasing cognitive declines, i.e. their perception was that they were doing just fine.

Large scale population studies from different parts of the world also hint that short sleep duration is associated with a significant cost to health. One meta-analysis reported that those who sleep less than 5-7 hours per night have a 12% greater risk of premature mortality. Of interest is that long sleep duration (generally longer than 9 hours per night) is also associated with an increased risk. However, it cannot be ruled out that longer sleep is also a marker of ill-health.[13]

In athletes, longer sleep duration (10 hours per night for up to 6 weeks) has been associated with increased athletic performance (such as sprint times, reaction time and basketball free throws), decreased daytime sleepiness, and improvements in mood.[14] Professional sports teams are paying attention to this and are now using technology such as the Fatigue Science Rediband™ to monitor the sleep of their athletes. They are also timing practices and travel such that sleep is optimized rather than compromised.[15,16] It is interesting the lengths that sports teams will go to in order to improve athletic performance, yet companies often don't pay attention to these factors.

Of interest is that of all the primates, humans sleep the least. In fact, the average human sleeps much less than predicted for a primate with our physiological characteristics.[17]

Collectively, the data suggest, that for the vast majority of people, 7-9 hours of sleep per night is recommended. And it could be that getting more (closer to 8-10 hours) is even better. Most people likely need 30-90 minutes more than they get. It is estimated that only about 1% of the population can function well on less than 5-6 hours of sleep per night.

While trying to add more sleep time to already busy days can seem daunting (if not impossible) consider what this researcher had to say: "17 h of alert and productive wakefulness may be of greater value than 18 h awake with tolerable levels of sleepiness and the associated effects on daytime performance."[18]

Either way, consistently shortchanging your sleep can have long-term negative health outcomes and will negatively impact your ability to think, focus and problem solve. Thus figuring out what is the right amount for you and then striving to meet that requirement as consistently as possible is important in order to prevent some of the health and cognitive problems.

The consequences of poor and/or shortened sleep are not pretty. For starters it can lead to an early death. However, if you are not that concerned with living longer, poor sleep can accelerate age-related declines in mental performance (think dementia and Alzheimer's disease), make it harder to lose weight (or easier to gain weight, as the case may be), increase inflammation, disrupt normal gut function, reduce one's ability to deal with stress, and compromise immune function, to name a few.[19]

This next section will explore these relationships.

Health Problems Associated with Lack of Sleep

"A good laugh and a long sleep are the two best cures in the doctor's book"

~Irish proverb

Obesity

Lack of sleep doesn't cause obesity per se; however, lack of sleep can affect various hormones which, in turn, affect eating behaviors and our metabolism which, in turn, increases the odds of weight gain.
For one thing, being awake longer increases opportunities to eat. It also upregulates appetite. It does this via disruptions to two hormones associated with appetite control, leptin and ghrelin, culminating in an increased drive to eat.[20]

Leptin, produced primarily by fat tissue, binds to receptors in the hypothalamus and sends a message to the brain to stop eating. Ghrelin, on the other hand is released from the stomach and stimulates an increase in appetite and consequent increased food intake.[21] [22] Lack of sleep interferes with these normal fluctuations and results in decreased leptin and elevated ghrelin, thereby increasing appetite.[20] Indeed, numerous studies show that less sleep can result in worsened and irregular eating habits like more snacking between meals and decreased intake of vegetables.[23] [19]

Combine sleep deprivation with high-fat feeding (especially saturated fat) and we have a bigger problem. Eating fatty foods like pizza, fries, chips, butter, cheese, ice cream, burgers (and other animal based foods) induces the expression of several pro-inflammatory cytokines in the brain which contribute to leptin and insulin resistance. As a consequence there is a reduced signal to stop eating, compromising and sabotaging our internal mechanisms of satiation. Another outcome of this inflammation is that it induces cell death of the hypothalamic neurons, which hurts this feedback cycle and further compromises our ability to stop eating when we have had sufficient calories.[24] [25] [26] [27]

Another problem with lack of sleep is that it reduces inhibition. In other words, we are more likely to go for the pizza and chips and less likely to go for the cherries or carrot sticks. Fatigue makes us crave more energy dense foods. From a survival perspective, this makes sense, as fatigue usually signaled an increased need for calories. Yet, now we are surrounded by readily available calorie dense foods. This is one reason why I am a big advocate for creating safe food environments. If those calorie dense foods are not readily available (either at home or the office) then they are less likely to call our names when we are fatigued and stressed and have lost all willpower to resist. Night owls, for example, show less dietary restraint and eat later in the evening. As a result, they have also been shown to have higher rates of obesity and diabetes.[28] [29]

Unfortunately eating late has been shown to impede weight loss efforts, even for the same number of calories. One study found that those who ate late during a 20-week intervention were less successful at weight loss even though there were no differences in energy intake and energy expenditure between the early and late eaters.[30] Other studies have shown that consuming significant calories after 8 p.m. is associated with higher obesity, independent of sleep duration.

Thus if you eat late, even if you do get 8 hours of sleep, the risk of weight gain increases and attempts at weight loss are compromised. This is likely because eating late not only decreases resting energy expenditure and glucose tolerance, but also disrupts the daily cortisol rhythm and thermic effect of food.[31,32,33,34] Thus, there is some evidence to support the idea of time-restricted eating, i.e. there is an earlier and discrete window when food is consumed, although this has been less well studied in humans. (Note: The thermic effect of food is the caloric cost of digesting and processing the foods that you eat.)

Gut Health

The gut and the role that the microbiome (or gut bacteria) plays in our health has seen a recent surge of interest. Maintenance of the integrity of the intestinal barrier is essential for protection from inflammation, better absorption of nutrients, and protection from diseases such as irritable bowel syndrome, Parkinson's disease, alcoholic liver disease and colorectal cancer.[41] [42] Of interest, is that there is an increased risk of these conditions in night shift workers, suggesting a link to sleep.[43,44]

Sleeping well appears to be critical for keeping the intestinal barrier healthy. Add alcohol and high-fat diets into the lack of sleep mix and this can further damage our gut barrier and microbiome (and our livers). During times of circadian rhythm disruption (aka jetlag), for example, intestinal hyperpermeability (or leaky gut) was exacerbated even further when mice were fed a high-fat diet.[45] The microbiome composition (or the makeup of the gut bacteria) was also altered when mice were fed a high fat diet, but was not changed when fed a low-fat diet, even during times of sleep disruption.[45] Thus, the negative effects of sleep disruption are worsened with a poor diet and, in particular, a high fat diet.

The moral of this story is if and when you are jet-lagged and/or sleep deprived, be sure to eat low-fat, high fiber foods, i.e. minimally processed plant foods vs. processed and/or animal foods in order to offset the negative impact of poor sleep on your gut health.

A side note on protein consumption and cortisol

There is evidence that eating an animal-protein meal can increase cortisol production. Studies show that cortisol levels will double after eating a single high-protein meal, like tuna and cottage cheese, compared to eating a meal of barley, rice and vegetables. Maintaining a diet high in animal-protein can chronically stimulate the hypothalamic-pituitary-adrenal (HPA) axis to pump out these stress hormones. Testosterone, on the other hand, can drop as much as 75% in people who are on animal protein diets. Perturbations in cortisol and testosterone levels can increase risk of weight gain and in particular, abdominal fat deposition. Increased levels of cortisol have also been shown to drive food intake even when there is no increased need for calories.[35] [36] [37] [38] [39] This could help explain why meat (including chicken) is associated with increased weight gain over time in many prospective studies, even after adjusting for calories.[40]

The gut microbiota may also play a role in regulating our circadian clock. Intestinal cells contain a powerful circadian clock that is somehow connected to the central clock in the brain in ways that we don't fully understand. What we do know is that having a healthy gut can likely contribute to better sleep, and better sleep contributes to a healthier gut.[34 45]

In summary, both sleep and meal timing are important when it comes to our gut and metabolism. Eating late and poor sleep is associated with decreased resting-energy expenditure and decreased thermal effect of food thereby increasing risk of weight gain, leaky gut, perturbations in the gut microbiome composition (especially when eating a high fat diet), other gut disorders, and blunted daily cortisol concentrations (or higher cortisol levels when they need to be low).[46]

Leaky gut occurs when the tight junctions in the gut, which control what passes through the lining of the small intestine, don't work properly. This condition could let substances leak into the bloodstream; which in turn, can lead to bloating, gas, cramps, food sensitivities, discomfort and a compromised ability to absorb nutrients.

Brain Function and Brain Health

What if there was a supplement that has been scientifically shown to boost memory, focus, flexibility, situational awareness and decision making? What if this supplement could also decrease your risk for age-related declines in cognitive function such as dementia and Alzheimer's disease? The good news is that there is such a supplement. It is called sleep.

So how does lack of sleep impact cognitive function, leadership effectiveness and brain health?

First, it negatively impacts numerous cognitive functions that are critically important for being sharp and making smart decisions. At the forefront, lack of sleep impairs vigilant and sustained attention.[7,47] Aspects of decision making and situational awareness also suffer when sleep is lacking. The risk for making mistakes goes up substantially. In real world applications (like the boardroom or leading a company) where focus and management of multiple demands are required, sleep deprivation can have very real and severe consequences.[48] An extensive study from Harvard Medical School found that doctors in training who were fatigued had 22% more errors compared to their more rested colleagues.[49] Bringing it closer to home, it is estimated that drowsy drivers account for 1 million accidents per year.[50]

Being able to reallocate one's attention to where it is most needed, adapting to changing demands, flexibility to adjust goals and expectations, ignoring irrelevant information and being able to focus effectively, learning agility and creative problem solving are all important leadership skills in today's ever-changing environment. These have all been shown to be impaired by poor sleep.[48,18]

Additionally, the ability to regulate emotions, interact well with others, discern ethical practices, weigh pros and cons and lend support to others, skills which are all central to leadership effectiveness, are hampered by sleep deprivation. Short changing sleep has also been shown to negatively impact leader charisma and the subsequent ability to inspire followers.[51,52]

Secondly, lack of sleep or disrupted sleep can increase our risk for developing dementia, including Alzheimer's disease (AD).

AD typically progresses from mild cognitive impairment in midlife to severe dementia over the course of many years. The average time from onset of cognitive symptoms to death is 10-12 years. The pathology, however, begins about 15 years prior to the first appearance of symptoms.

The hallmark of AD are amyloid plaques that begin to deposit and aggregate within neural tissue.[53] Tau tangles, the other pathological hallmark of AD, develop later in the course of the disease. These can be found throughout multiple brain regions as the disease progresses, including regions that are critical for the sleep-wake cycle.[54] Thus having AD disrupts the sleep cycle. In addition, given that poor sleep can cause deficits in synaptic plasticity and memory processes, it stands to reason that lack of sleep can contribute to the progression of AD as well.[7]

The strongest evidence showing that sleep problems are associated with increased risk of AD are in animal studies. One study on mice found a 25% increase in levels of extracellular Amyloid-beta (a protein marker of AD risk) in mice during wakefulness compared with sleep and persistently higher levels in mice which were sleep deprived.[55] Conversely, increases in total sleep time by 10% significantly reduced the plaque burden. These studies suggest that sleep plays a role in modulating levels of beta-amyloid proteins and amyloid plaque deposition.

In humans, a causal relationship between sleep deprivation and AD is more difficult to show; nevertheless, the studies are compelling.[7]

A study from the Netherlands found that a single night of sleep deprivation increased levels of *AB42* (or beta-amyloid proteins) in the cerebral spinal fluid. A night of increased sleep was associated with a 6% decrease in these levels.[56]

A study on young healthy adults (avg. age 27 years) found that 24 hours of wakefulness resulted in increases in plasma concentrations of these beta-amyloid proteins as well as other markers of reduced clearance. Although, increased sleep did reverse these changes.[57]

In another study, better sleep quality attenuated the effect of the ApoE4 (a gene that is associated with increased risk of AD) on the risk of AD and on the rate of cognitive decline. Autopsies of over 200 people who died during the study showed that better sleep attenuated the effect of the ApoE4 allele on neurofibrillary tangle density and plaque accumulation within the brain.[58,59]

Finally, in short-term prospective studies, sleep disruption has been shown to increase the risk of dementia. One study found that increases in measures of sleep fragmentation were associated with a 22% increase in the annual rate of cognitive decline. Those in the highest (90th percentile) of sleep disruption had a 1.5 fold risk of developing AD compared with someone in the 10th percentile.[60] Another study found a 33% and 51% increased risk of dementia and AD, respectively, in men with self-reported sleep disturbances.[61,57]

So if the above data stresses you out, well unfortunately, stress isn't good either.

Stress

While stress can negatively affect sleep, lack of sleep is also a cause of stress, or at the very least, reduces your stress tolerance, i.e. you are more likely to let little things stress you out. Investigators have demonstrated that sleep deprivation or restriction can increase the activity of the neuroendocrine stress systems and hormones (a.k.a. the hypothalamic-pituitary-adrenal axis and autonomic sympatho-adrenal axis) and also the reactivity of these systems to downstream stressors, i.e. this is a bit of a negative downward cycle. The less sleep you get, the more likely you are to react stressfully; the more stress you have, the less likely you will have good sleep.[62] The long-term outcomes of this cycle are not good. Chronic activation of these systems, and the consequent disruption in the regulation of serum cortisol levels, may lead to disease, neuronal damage, and early onset aging.

Sleep and Immune Function

Finally, there is the potential for sleep deprivation to negatively impact immune function. A recent analysis of 153 adults found that those who slept <7 hours per night tended to have an increased likelihood of developing a cold when exposed to a cold virus compared to those who slept 8 hours. Immune incompetence has also been reported following a vaccination during sleep deprivation, i.e. there was less of an antibody response to the vaccine. Finally, poorer sleep has also been associated with reduced recovery from infection.[13]

So, barring clinical sleep problems like sleep apnea or restless legs syndrome (which require more clinical type interventions), what can be done to improve sleep quality and, if needed, sleep duration?

Helpful Practices to Improve Sleep Quality and Duration

"Never waste any time you can spend sleeping"

~ Frank H Knight

1 Determine what your sleep needs are

Find a week or two where things are more relaxed and when you don't use an alarm clock to wake you up to see where your sleep duration naturally falls. When leaders were asked how many hours of sleep they felt that they needed to feel refreshed and rested, on average they said they needed 7.5 hours. Over 50% said they needed 8 or more hours.[5] Thus, most of us probably have a pretty good idea of what we actually need. That said, I personally used to think I needed around 7.5 hours. But after paying more attention to my sleep and sleep habits, I found I need closer to 8 hours.

2 Maintain a Consistent Sleep/Wake Schedule

"Every night I go to sleep late and in the morning I realize it was a bad idea." ~Unknown

In order to keep the external cues aligned with the internal clock, it is important to go to bed (and sleep) at a similar time each day and get up at a similar time each morning. The research does suggest that irregular sleep times are associated with greater daytime sleepiness and worse sleep quality.[63] The goal is to not vary your bedtime and get-up time by much more than 30 minutes. This is not always possible with travel and multiple time-zone changes, but being consistent as much as possible is helpful. Because melatonin starts to build in the evening and tends to peak in the early evening hours, you may want to get to bed earlier than 10 or 11 p.m. to take advantage of this increase, especially as you get older. It has been said that the sleep you get before midnight is "the money time sleep"[64]. If you tend to go to bed much past 10 or 11 p.m., gradually move that time earlier by 15 minutes every couple of nights in order to create that shift to a slightly earlier bedtime.

In the CCL study, most leaders reported going to bed between 10:30 and 11 p.m.; and most wake times were clustered between 5 and 6 a.m., which would account for the reported 45-60 minutes of sleep debt. I will always remember a four-star general who attended one of our programs. During the week we have a customary Thursday

night dinner that is something of a celebration of the week. During this particular week, I remember the general got up from the table a few minutes before 9 p.m. He politely excused himself saying that it was his bedtime and that he needed to get a good night's sleep. I remember talking to him during the week asking him about his days and schedule. He said that every minute of his day was scheduled. He even traveled with a couple of aides who helped manage his schedule. Thus he really had to be "on" and alert all day, so, for him, guarding his sleep time was an important strategy.

3 Get Light Exposure at the Right Time

A good night's sleep starts when you wake up. Try to get good light exposure upon awakening and throughout the day. Light exposure first thing in the day triggers your body to produce optimal levels of daytime hormones (like cortisol and serotonin) that regulate your biological clock. Too little light during the day and too much light in the evening will negatively impact your sleep, i.e. it tends to turn these hormone cycles upside down. Your cortisol levels rise when you want them to be low and they are low when you want them to go up. Light also destroys melatonin, which is a good thing in the morning, but not at night or in the evening. When people mess up their cortisol and melatonin cycles it has been said that they are "wired and tired".[64] Getting outside for some exercise can thus serve two important sleep promoting functions, day-light exposure and exercise!

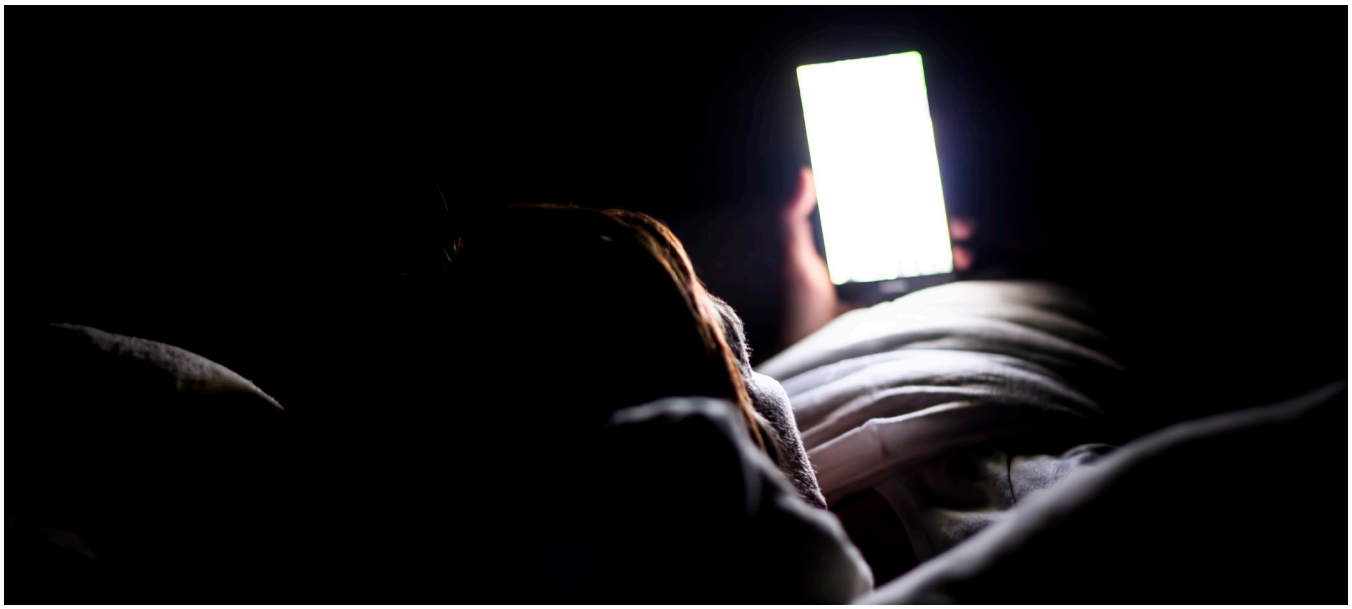
Serotonin, which is the precursor to melatonin, is something you also want to see go up earlier in the day (as it does with both exercise and light exposure). And, ideally you want levels to go down at night.

If you work all day in areas where there is little natural light, you are likely light deprived. Indoor lighting is 100 times less bright than outdoor light on a sunny day. Even a cloudy day delivers 10x more brightness than indoor lighting. One study found that office workers who have direct access to windows at work slept 46 more minutes on average during the night.[65]

If you live in a northern part of the world where it stays dark later in winter months, purchasing a light that can emit 10,000 lux and having it on for 30-40 minutes in the morning can help, although 90 minutes is likely better. Light exposure in the morning can powerfully shift the biological clock to help with an earlier bedtime.[66] This has implications for travel. If you are traveling east, get up early that first morning and get some early morning outdoor light exposure. This will help shift your biological clock such that you will feel sleepy earlier.

Studies do show that morning light exposure helps to advance sleep timing, i.e. it will help you fall asleep earlier, while evening light has been shown to delay sleep onset.[68] Dimming those lights in the evening is thus quite important, which leads me to #4.

In one study, researchers looked at how light treatment affected insomnia in older adults. They found that 45 minutes of light exposure (10,000 lux) resulted in sleep time improvements of 91 minutes compared to only 14 minutes of increased sleep in those who were exposed to the light for 20 minutes.[67]



4 Avoid Screen Exposure and Bright Light 60-90 Minutes Prior to Bed

As previously mentioned, melatonin produced by the pineal gland and other tissues is secreted naturally as it gets darker outside. However, light exposure in the evening can blunt melatonin production. Even small exposure to non-red light, in particular, can hurt melatonin production.

Avoiding screens and in particular the blue light emitted by electronic devices prior to bedtime (as much as 90 minutes prior) is especially important. Artificial light exposure disorients your body's natural preparation for sleep and triggers your body to produce more daytime hormones, such as cortisol. One study found that nighttime iPad readers took longer to fall asleep, felt less sleepy at night and had shorter REM sleep compared to those who read printed books using a lamp. IPad readers also secreted less melatonin and were more tired the next day, even if they got 8 hours of sleep. Thus, nighttime usage of these devices can lead to chronic disruption of circadian rhythms and lead to chronic sleep problems.[69]

Data from CCL found that leaders who reduced their use of electronic devices in the evening tended to have better sleep quality and less difficulty in falling asleep, even after controlling for demographic and individual differences like sleep cycle preferences, age, and exercise.[5]

Another study found that a 5-hour exposure to a computer screen significantly suppressed melatonin and reduced sleepiness compared to using a non-LED-backlit screen. And, although melatonin levels did rise during the night, they did not rise as steeply compared to when using a non-LED screen.[70]

In another study, melatonin suppression was 22% lower after two hours of tablet use.[71] Maximum suppression, however, could be as high as 70% after just 1 hour of exposure.[72,73] This leads me to #5.

5 Create a Technological Boundary

"Some people don't sleep because they have insomnia. I can't sleep because I have internet connection." ~Unknown

With the increased use and dependence on personal electronic devices, boundaries between work and home have become blurred and limit our ability to psychologically detach. Thus, in addition to limiting light exposure, creating specific boundaries around the use of these devices helps with "winding down". This in turn will help to increase one's perceived control over work-to-home interruptions and can aid recovery from stress thereby improving sleep.[74]

Some companies have policies which limit after hours e-mails. Late night emails are often the reason why leaders go to bed stressed making it difficult to let go emotionally and mentally. This impulse to constantly, instantly respond to electronic communication is known as telepressure. For those who struggle to detach from work, the effects of telepressure is worsened.[51]

Some CEOs that I know will turn off the Wi-Fi to limit use of devices by both themselves and their kids. Research shows that we touch, swipe or tap our phones over 2,600 times a day, although heavy users can exceed 5,000 times per day.[75] This constant use that is bordering on addiction is contributing to a state of "continuous partial attention" which limits our ability to focus and possibly serves to lower our cognitive capacity (i.e. IQ). These cognitive costs are highest for those with the highest smartphone dependence.[76] Even tech savvy Silicon Valley types such as Justin Rosenstein, who invented the "like" button, are figuring out ways to reduce their dependence and use of smartphones and other devices. Ironically, they are even sending kids to schools where iPhones and iPads are banned.[77]

Regardless, these devices are a necessary part of doing business. Being aware of their ability to distract and figuring out how to use them judiciously by creating boundaries around their use can be helpful in a number of ways. Making a distinction between true urgency versus the habitual, always-on responsiveness can go a long way to restore work-sleep balance.

6 Keep the Bedroom Cool, Dark and Quiet

About an hour before sleep, our core temperature starts to rapidly decline. Thus, sleep onset is initiated by a decrease in core body temperature and an increase in skin temperature (which helps dissipate heat). Core temperature continues to decline across the night and starts to increase upon waking. Insomniacs have been shown to have higher core temperatures right before bed compared to good sleepers.[78] In fact, when insomniacs were fitted with cool caps, they ended up doing better than those without sleep problems.[79]

Higher core temperatures can occur with either increased internal heat production and or reduced heat loss via the periphery, such as the skin. Stress for example, can increase heat production. Sleeping in a room that is too warm and/or using too much bedding can hinder heat loss.

Sleeping too cold, however, can also hurt sleep, unless there are adequate covers. In studies where bed covers and clothing are adequate, ambient temperatures as low as 3 degrees C are fine (ok that is pretty cold and equates to around 36 degrees F). Thus, sleep is more likely to be disturbed during heat exposure rather than cold exposure. Humid heat is worse as it makes it more difficult to have appropriate heat loss.[80]

The optimal room temperature for most people is around 60-68 degrees F (or around 17 degrees C). One study found that sleep at 17 degrees C (or 62 degrees F) resulted in better sleep than sleeping at 22 degrees C or 71.6 degrees F. They also found that sleeping in wool sleepwear was better than cotton.[81] If you are a hot sleeper, you can purchase pads to sleep on that will help to cool things down (although some work better than others). As far as I can tell, there are no cooling caps for purchase.

Finally, to avoid light exposure, make sure the room is dark. Cover up those annoying bits of light that can be emitted just by having some electronic devices plugged in. Make sure your windows are well covered such that ambient light from city street lamps and passing cars does not disrupt sleep. I personally use, and travel with, eye shades.

7 Get Regular Exercise

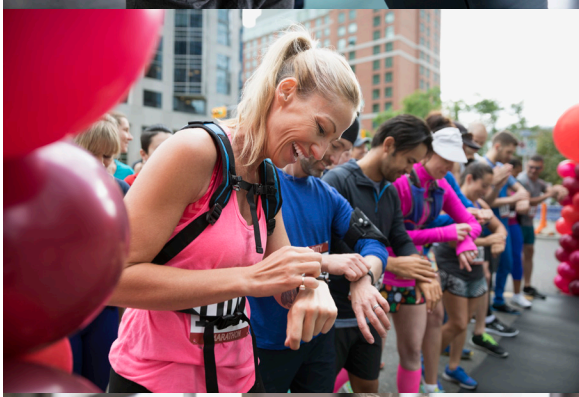
There is mounting evidence that regular exercise is an effective intervention for those who do not experience adequate sleep quantity or quality.[82] On the whole, regular exercise is associated with increased slow wave sleep (or stages 1-4), total sleep time, less sleep latency (exercisers fell asleep sooner), less time spent awake after falling asleep and less REM sleep. Interventional studies have shown that exercise can help with sleep across the age spectrum, from adolescents to postmenopausal women, middle-aged men and women as well as older adults.[83,84]

However, unless you are a good sleeper, the timing of your exercise may be important. One study found that morning aerobic exercise resulted in better sleep than exercise performed at noon or in the evening. [85] However, if you are a good sleeper it likely doesn't matter that much when you exercise. Contrary to popular belief, exercise before bed, as long as it isn't strenuous, is fine, unless you are a poor sleeper. The National Sleep Foundation has amended its sleep recommendations for good sleepers to encourage exercise without any caveat as to time of day as long it is not at the expense of sleep duration.

Better sleep may help to improve the exercise experience as well. Some studies indicate that sleep loss is directly correlated to increased risk of athletic injuries. Sleep also impairs the functional recovery of muscles following an injury. Eight hours of sleep loss, for example, down regulated the activity of protein synthesis important for muscle repair.[86]

For those of you who are heavy exercisers, sleep disturbances are also associated with overtraining during periods of high volume training. Poor sleep is also associated with a higher risk of getting an upper respiratory infection during periods of heavy training.[87]

What type of exercise is better? Aerobic, resistance training and mind-body exercise, like Tai Chi and yoga, have all been shown to help with better sleep quality. However, one study found that mind-body exercise also improved mood, mental health and sleep compared to those participating in just aerobic exercise. It is likely that a blend of exercise modalities is helpful.[82]



8 Eat and Drink Right and Not Too Late

Melatonin and Food

Melatonin is not just good for sleep. It has also been shown to have antioxidant capabilities, enhance immune function, have anti-aging, anti-cancer and anti-inflammatory effects, and regulate mood and body temperature. Thus, the benefits of eating foods which contain melatonin extend beyond their role in aiding and regulating sleep.[88]

Numerous foods contain significant levels of melatonin, and eating melatonin rich foods has been reported to improve sleep efficiency and assist in sleep.

Melatonin is not found in significant quantities in meat (even though it is produced in the pineal gland of animals), although fish does contain some. Fish, however, come with a high risk of contamination and are a significant source of arachidonic acid (which promotes inflammation), so the benefits are likely minimal.

Melatonin is most commonly found in edible plants. The foods with the highest sources are nuts (pistachios and walnuts are the highest), mushrooms, berries such as tart cherries and raspberries, whole grains such as pigmented rice (like black rice), wheat, barley and oats, and germinated legumes (like mung beans) and seeds. Some herbs also contain high levels such as Huang-qin and St John's Wort.

Plants exposed to high ultraviolet light (such as those grown in Alpine and Mediterranean environments) contain higher amounts of melatonin than the same plants grown under lower UV exposure. Plants grown at high altitude (like Gogi berries) or in a hot climate (like tropical fruit) also have higher levels. One study which compared levels in six fruits found that levels were highest in mangos, followed by pineapple, papaya, oranges and bananas.[89]

Foods high in tryptophan (as found in bananas, nuts and seeds) may help to enhance or up-regulate melatonin synthesis and lead to increased melatonin production in the body.[88]

What about taking a melatonin pill? Studies show that there is poor absolute bioavailability, which ranged from 1% to 37% (although it is higher in women). It can be used to help with jetlag, but there is a fast release, i.e. one study found that the half-life was around 36 minutes for males and 41 minutes for females. [90] Thus, in a jet-lag situation, it might help one fall asleep sooner, but may not help one stay asleep. There are also concerns that one can become desensitized to it resulting in the need to take more and more. Thus, it should be used sparingly and with caution.

Melatonin from foods does serve to increase circulating melatonin and there is also good bioavailability. Eating these foods can thus provide antioxidant and anti-inflammatory benefits, both from the melatonin as well as other nutrients found in whole plant foods.

However, while these foods are associated with health benefits, relatively few studies have looked at their impact on actual sleep. Two fruits, however, that have shown benefits to sleep are kiwi and tart cherries.
In the tart cherry study, older adults consumed either a Kool-Aid placebo drink or a tart cherry drink. They found modest but significant improvements in sleep. Those drinking the tart cherry juice fell asleep a few minutes faster

and had 17 fewer minutes of waking up after sleep.[91] Similar results were found in those eating the actual cherries, with seven different varieties shown to boost melatonin and sleep times.[92] As a bonus, tart cherry juice has also been shown to reduce post exercise muscle soreness and inflammation on par with aspirin and ibuprofen.[93]
In the kiwi study, adults ate two kiwis one hour prior to bedtime for four weeks. Those eating the kiwis showed significant improved sleep onset, duration and efficiency.[94]

What about Tryptophan?

Tryptophan is a precursor to serotonin, which is a precursor to melatonin, so increasing brain levels of tryptophan may be helpful in promoting better mood as well as sleep.[95] There is a commonly held belief that eating high protein foods, like turkey, increases tryptophan levels in the brain. Tryptophan, however, competes with other amino acids for transport across the blood brain barrier. Thus, in high protein foods like turkey, it gets muscled out of the way and will actually lower levels.

Carbohydrate foods, on the other hand, produce an insulin driven decrease in branched chain amino acids (but not in tryptophan) thereby decreasing competition. This raises the plasma tryptophan ratio facilitating entry into the brain. Eating high protein foods actually results in lower brain tryptophan levels.[96] As one study showed, a high carbohydrate meal (waffles and OJ) resulted in higher tryptophan levels than a high protein (turkey, egg, cheese) meal.[97]

Better yet are foods with a high tryptophan-to-protein ratio. Examples are nuts and seeds, like pumpkin seeds. One of the best seeds is butternut squash seeds. One study used butternut squash seeds to increase brain tryptophan levels.[95] However, these are not readily available, not even on Amazon (I actually looked and only found the seeds that you plant in the ground). But you can dry and roast your own (see recipe sidebar).

Recipe: Extract the seeds from a butternut squash (you might need to clean them off a bit), mix them with a bit of salt, Mrs. Dash and/or other spices. Place on a cookie sheet and roast in the oven at 350 degrees until browned and crispy. They are really quite tasty.

Caffeine

Caffeine consumption can have deleterious effects on healthy sleep patterns. Depending on your physiology, the half-life of caffeine, or how long it takes for half of the ingested dose to wear off, is about 5-8 hours. This half-life also increases with age. Women who take oral birth control require even longer to process caffeine.

Using caffeine to mask sleep deprivation can create an unwelcome cycle. For example, you may drink caffeinated beverages because you have trouble staying awake during the day. But the caffeine keeps you from falling asleep at night, shortening the length of time you sleep.

The half-life represents the time it takes for half of the caffeine to metabolize. For example, drip brewed coffee has as much as 163 mg/cup (or 8 oz.). Thus, after 5-8 hours, you will still have over 80 mg in your system (which isn't insignificant). By way of comparison, decaffeinated coffee contains 6 mg/cup, Red Bull around 80mg/can and some energy drinks can contain over 300 mg/serving. For more information you can go to: www.caffeineinformer.com.[98]

In one study, participants given caffeine at different times, three hours before bed or six hours before bed, all showed significant and measureable disruptions in their sleep. Those who drank it six hours before bed thought that they slept well; but the sleep monitor showed they still lost about an hour of sleep and didn't dip into normal ranges of deep and REM sleep.[99]

High caffeine intake, especially amounts found in caffeinated energy drinks, is also associated with increased risk of urinary incontinence in both men and women.[100,101] So, best to get your caffeine (if you must) from coffee or green tea and restrict intake to first thing in the morning and then drink decaf or non-caffeinated drinks (such as water or herbal tea) after that.

On a good note, coffee and caffeine consumption may reduce one's risk for liver cancer and may confer some cognitive benefits.[102] So the news is not all bad. On the negative side, coffee has been shown to hurt arterial function by reducing the artery's ability to vasodilate.[103] Decaf coffee, on the other hand, can help to improve endothelial function.[104] So another good reason to switch to decaf.

Alcohol

In healthy adults, there is generally a dose response relationship between the amount of alcohol consumed and its negative effects on sleep, i.e. effects are typically smaller at lower doses and worsen with higher doses. Blood alcohol levels in women are higher than in men after consuming the same amount of alcohol, so women have to be more careful and are more likely to be negatively affected. Drinking alcohol before bedtime does impair sleep. One study found that even late afternoon or early evening drinking compromised sleep, even though measured breath alcohol levels were zero. This might be a good reason to skip that glass of wine in the evening and have it for lunch (or breakfast) instead, although the boss might not appreciate that.

Magnesium and B12

Magnesium is an essential mineral found in whole grains, leafy green vegetables, beans and nuts. Most U.S. adults don't meet the 400 mg/d RDA for intake of this mineral (likely because they eat a plant deficient diet).[105] A relationship between the concentration of magnesium in the blood and sleep has been suggested.[95] Oral magnesium supplementation has been found to improve sleep quality and total sleep in subjects with low magnesium status in a couple of studies.[106] One study found a preparation containing melatonin, magnesium and zinc taken before bedtime improved sleep quality and sleep time in elderly subjects with insomnia compared to a placebo.[107] Although it is hard to say whether it was the magnesium or the melatonin which helped. Magnesium, however, does play a role in enhancing secretion of melatonin from the pineal gland.

As with most nutrients, it is best to get your magnesium from food. Increasing your intake of greens, beans, nuts and seeds will help to meet the RDA as well as confer other benefits. Magnesium can also be absorbed via the skin, so spraying a supplement on the skin can also help if dietary intakes are insufficient.

B12 also contributes to melatonin secretion.[108] Treatment with different doses of B12 can potentially benefit sleep, although conflicting results exist.[95] Regardless, it is generally advised to take a B12 supplement. B12 is produced by bacteria, and given that we sanitize everything, it is prudent to supplement. It is also a water-soluble vitamin, so taking too much is likely not toxic.

Melatonin rich foods	Foods with a good tryptophan to protein ratio	Other foods/supplements that may help with sleep	Drinks to severely limit or avoid in the afternoon and/or evening
Nuts: pistachios and walnuts in particular	Seeds: butternut squash, pumpkin, sesame, sunflower	Tart cherry juice	Alcohol
Mushrooms	Bananas	Kiwis	Caffeinated beverages
Berries: tart cherries, gogi berries, raspberries	Walnuts	B12	
Tropical fruits: mango, pineapple, papaya	Soy	Magnesium (best sources are from grains, greens, beans and nuts). Supplement may help.	
Whole grains: black rice, barley, oats	Sea vegetables like kelp and seaweed	SOM™ Sleep Formula*	
Herbs: Huang-qin and St John's Wort		*contains ingredients which may help with sleep such as melatonin, B6, magnesium, L-theanine and GABA	

9 Practice Mindful Meditation

"I want to sleep but my brain won't stop talking to itself." ~Unknown

Rumination, where one is worried or anxious about things that could happen in the future or where one replays the tape over and over again about stuff that has happened in the past, is probably one of the biggest impediments to sleep. I don't know how many executives have told me that they don't have problems falling asleep; but once they wake up in the middle of the night they can't turn their brain off, making it difficult to get back to sleep. As previously mentioned, this is one of the biggest impediments to sleep for leaders.[5]

Being able to turn off the monkey brain is a skill that takes practice. Meditation may be one way to do that. One study on older adults with sleep disturbances found that those trained in meditation had improved sleep over those who were taught other good sleep hygiene practices.[109] Other secondary health benefits, like less depression and fatigue, were also noted in the meditation group. Thus, the benefits of having a regular meditation practice are numerous and go beyond sleep.

As one leader said, "I have much improved sleep by focusing on some mindfulness meditation each evening before going to sleep, as well as trying to build a habit to write down things I'm grateful for. It's made a big difference in my sleep." [5]

Personally, I have found that listening to a book on tape has helped me to fall asleep when I wake up in the middle of the night, although it does depend on the reader (a nice relaxing voice) and the story (not too exciting). I also use an app called HeartMath (a similar practice to mediation) which provides biological feedback to ensure that I am in the right frame of mind

There are a number of apps that can help with guided meditation.
Click here for a list of the top ten apps. https://www.igeeksblog.com/best-meditation-apps-for-iphone-and-ipad/
Calm and Headspace are two of the most well-known.

10 Don't smoke. Not good for your health or your sleep. Need I say more?

In Conclusion

You snooze, you win. Sleep can powerfully affect your health, your energy and your brain. Consistently short changing your sleep might feel necessary in order to make time for other priorities. However, when sleep is compromised, people quickly adjust to new baseline levels of fatigue and don't realize how much it can erode cognitive performance, immune function, physical performance and health. Lack of sleep may even accelerate aging.[110] Engaging in healthy eating habits (like eating more whole plant foods), going to bed and getting up at regular intervals, curtailing screen time in the evening, not smoking, limiting caffeine and alcohol intake, getting the right amount of light at the right time, regular exercise, and practicing mindful meditation can all contribute to better sleep.

Sometimes changing one thing like sleep will aid in creating other healthy habits like regular exercise and eating better. Create a virtuous cycle of going to bed a bit earlier (remember sleep before midnight is "money time"), doing some aerobic exercise in the morning, and eating a nutrient dense breakfast (a kale smoothie* or steel cut oats, for example). This will go a long way towards sustaining your energy and performance throughout the rest of the day.

The challenging work of leadership requires substantial psychological effort and energy. When sleep is suffers, the primary mechanisms of recovery are shortchanged and performance suffers. Yes, sleep is a time investment, but it will pay dividends over the long-term. If four-star generals can make sleep a priority, so can you.

Win the night, win the morning, win the day

*for smoothie recipes go to www.sharonlarsen.org/Recipes/Smoothie-Recipes.html

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