Optimizing Sleep
A whitepaper on maximizing sleep’s powerful effects on health and performance

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Introduction

Your sleep quality will drive either a slow crawl to chronic disease or a daily renewal towards optimal health and performance. Here we will look at some ways to develop the latter.

Sleep is not passive

Nothing is passive about sleep. Our bodies actively carry out many tasks from memory to repair and more while catching some z’s.

We must take an ACTIVE role to support sleep as an ACTIVE process.

Roadmap

In the pages ahead, we will look at what is supposed to happen during sleep, things disrupt it, and strategies to improve it.

Matthew Walker, Ph.D.

He is a sleep researcher out of University of California Berkely. I read his book a while ago, *Why We Sleep*. Recently, he has been making the rounds on podcasts, so I have consumed hours more of his insight.

Most of the stats and studies come from his book, unless otherwise cited.

I took a stack of my kindle notes (which you can access here), podcast notes from 5+ hours on Peter Attia, and another couple hours with Rhonda Patrick. I then reduced the most interesting tidbits to a few sheets of paper and a notecard, then organized them in to a few sleep facts, consequences of bad sleep, some causes of sleep disruption, and strategies I find to be most useful.

Sleep Pressure

Before diving in to sleep itself, lets look at what drives our desire to sleep (sleep pressure).

Adenosine

A chemical called adenosine builds throughout the day. As its amounts grow,
you feel an increasing desire to sleep. Adenosine Tri Phosphate (ATP), is the main cellular energy currency. When we consume ATP, adenosine remains, so ATP / energy consumption drives sleep pressure.

Adenosine interacts with (appropriately named) adenosine receptors to signal sleep pressure (along with other instructions). Caffeine is an adenosine receptor blocker (antagonist). It promotes wakefulness by decreasing sleep pressure - temporarily. While it blocks the receptor, the adenosine remains in circulation and continues to build. So, caffeine is an excellent hack to feel more awake, but it doesn’t replace sleep. Once the caffeine wears off (the half-life is about 6 hours), your receptors get hit with all that adenosine that continued to build.

Naps, and sleeping, result in less circulating adenosine. Cup of coffee and a 20 minute nap midday can be a great way to recover from extra sleepiness.

**Circadian Rhythm**

Most cells and systems in the body operate on a circadian rhythm (day / night cycling), not just sleep centers in the brain. We need to maintain a distinct rhythm to reap the benefits of sleep. Light is a key player in circadian signaling - including different wavelengths of light (red / blue / etc). Temperature is also an important input for circadian rhythm. Activities such as meals and exercise at the wrong times can disrupt our rhythm, at least partly via temperature.

Now that we have reached bedtime in this story, let’s look at what happens during sleep.

**Sleep Stages**

The brain exhibits certain electrical signatures during sleep. All stages of sleep are important.
Deep Sleep

Deep, slow-wave sleep is named for its electrical pattern. Also called Stage 3/4 non-REM (NREM).

Deep sleep occurs mostly in the first half of the slumber - at least the first half

1 https://www.researchgate.net/figure/EEG-pattern-of-different-sleep-stages_fig1_242343002
2 https://www.sleepadvisor.org/stages/
of when your bedtime should be. If you go to bed late any reason (say 2am when normal is 10pm), deep sleep will not occur the same.

Deep sleep quantity decreases reliably as we age. Unfortunately, the benefits we should receive also decrease.

**Writing Memories To The Hard Drive**

During deep sleep, we move what we learned that day from temporary working memory to permanent storage. Similar to what happens when clicking save on the term paper open. No deep sleep, no save button. Once we save a file during deep sleep it will be accessible again later for recall. We must enter deep sleep for a sufficient time nightly to build memories.

**Body Temperature Drop**

Before bed, our core body temperature starts a pronounced downward trend that won’t turn around until early morning. This decreasing body temperature is important to enter deep sleep. Anything that increases body temperature, such as a late meal or exercise, will keep temperature higher, and will impede the brain from attaining the slow wave electrical signature.

**Cardiac Rest**

Entering deep sleep allows the heart to relax as well. The lowest heart rate happens, at least it should, in the first half of the night. Walker describes a recalibration process here that resets blood pressure. Sleep trackers with HR are helpful here. If your HR doesn’t come down early in your sleep, the heart didn’t have time to rest and reset. Alcohol (over 1 or maybe 2 drinks), late meals, and late or strenuous exercise are reliable hinderances to a good resting HR.

**Growth Hormone**

Growth hormone (GH) facilitates several beneficial functions - analogous to a fountain of youth for many. From metabolism, to lean body mass, we all require sufficient growth hormone to achieve optimal health. We release GH in a pulsatile fashion during deep sleep\(^3\). Decreased deep sleep leads to decreased

\(^3\) https://www.ncbi.nlm.nih.gov/pubmed/8627466
GH and signs associated with aging.

**Anxiety**

Lessening anxiety is long been a trait of REM sleep, but a new study showed deep sleep can reduce symptoms⁴. If you have chronic anxiety, improving sleep is a worthwhile goal.

**Brain Cleansing**

Recently, researchers found the brain has a glymphatic system. It operates like the lymphatic system throughout the rest of the body. Not the best mental picture, but analogous to a sewage system.

For this system to flow efficiently, glial cells in the brain (this is where the g came from when they named it glymphatic), must shrink - a lot, 60-200%. This allows cerebrospinal fluid (CSF) in the brain to wash over more areas and clear out toxins and substances such as amyloid. Yes, the same amyloid implicated in plaques associated with Alzheimer’s.

Better than a theory, we can see this CSF washing process, have a look at this short video:

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⁴ [https://news.berkeley.edu/2018/11/06/chronically-anxious/](https://news.berkeley.edu/2018/11/06/chronically-anxious/)
REM Sleep

Rapid Eye Movement (REM) sleep is best know as dream sleep. While dreams can happen in other stages, REM is where the most vivid typically occur. During this stage the body is paralyzed, so we don’t act out our dreams just to find injury.

REM occurs most in the second half of our sleep session. Early awakenings shortchange REM disproportionately.

Learning Benefits

Where memories are written to the hard drive in deep sleep, we contextualize them during REM. I like the database analogy here. Databases store lots of data and index the data so it is readily retrievable and useable - like google for the web. It doesn’t do much good to have 1 million files if you can’t find them…

This indexing leads to problem solving. As we contextualize and build
connections to past memories we can expand our creative abilities and increase problem solving. Many have written about searching for a complex solution by thinking about the problem in the evening and letting your REM sleep period go to work.

**Mental Health**

REM is classically associated with improved mental and emotional health. Anxiety reduction and other mood benefits occur here.

**Other Happenings**

Our heart rate and breathing are increased both in rate and variability. Blood flow, including supporting that classic “morning wood”, increase during REM sleep.

**Light Sleep**

As we close our eyes, we enter the transitional Stage 1. Eyes roll back, and we lose track of our surroundings.

Stage 2 is also light sleep, and we here we reduce HR and body temperature on the way to deep sleep.

We spend almost half the night in light sleep, and it is often overlooked on the importance scale. However, all stages of sleep matter and they must happen in order - although the durations vary.

For instance, stage 2 has the distinction of electrical signatures called sleep spindles and K-complexes. Spindles are short electrical bursts that feature information transfer from one brain region to another. K-complexes are a longer electrical waves and can form in response to a stimulus in your environment. K-complexes and sleep spindles aid in keeping you asleep.

More sleep spindles and K-complexes in stage 2, better memory transfer and sleep quality.

**Consequences Of Insufficient Sleep**
This section highlights some of the havoc sleep deprivation wreaks on our biology. Rest assured (pun intended) insufficient sleep contributes to most maladies we face.

Brain

I start here as the stages of sleep are measured in brain waves as measured by EEG. Easy bet, we have plenty to look at here. Not only in disease, but how we interact

Neurodegeneration / Alzheimer’s / Memory

Researchers have shown Alzheimer’s patients have disrupted sleep patterns. Above we showed deep sleep allows the glymphatic system to clear amyloid. Amyloid is associated with Alzheimer’s, although likely not causative. Other proteins such as tau are also cleared during deep sleep. These proteins participate in other neurodegenerative disease processes. Sleep is required for detoxifications. Sleep deficiency leads to toxicity.

Further, memory storage and transfer occurs during sleep. Disruptions in any stages, or just deficiency, leads to decreased memory and learning. Alzheimer’s is Exhibit A. These patients cannot learn new information, but events ten years earlier are like yesterday.

Sleep problems appear to be causal in neurodegeneration.

Mood / Depression / Anxiety

Sleep and mental health have a bidirectional relationship. Poor sleep effects mental health, mental health challenges sleep quality.

Lets look at two brain regions: (1) the prefrontal cortex (PFC), just behind the forehead, responsible for executive function/reasoning, and (2) the amygdala, more centered and deeper behind the eyes, responsible for strong emotions. For emotional reactivity, the amygdala acts as a gas pedal, where the PFC acts as a brake. In sleep deprivation, a 60% amygdala amplification occurs, translating to emotional reactivity. Perhaps, this is aided by the observation the our PFC is essentially offline when awakened early. All gas, no brake. Not a good scenario.
REM sleep is known to decrease anxiety. One way is that during this stage, norepinephrine (NE, aka noradrenaline) is shut off. NE is a stimulating neurotransmitter. This break from NE during REM is a much needed reprieve.

**Altered Mood & The Workplace**

A University of Washington study in Walker’s book showed sleep deficiency presents in the workplace as (1) seeking less challenging tasks (2) slacking off (3) decreased creativity (4) more deviant, less ethical. Further, low on sleep are less inspiring. Other research shows a tendency to blame other people and exhibit social loathing.

Couple these effects with increased emotional reactivity seen above, a dysfunctional employee may simply be a sleep deprived individual. This is why Aetna, an insurance company, put in a sleep performance bonus for those employees who got 7 hours a night.

**Altered Relations at Home**

Transitioning from work to home, lets see how sleep deficiency impacts intimate relationships. Sleep between 4-5 hours and testosterone production in men shifts 10 years ahead, meaning a significant decrease. For the ladies, short sleep leads to a 20% decrease in follicle stimulating hormone (FSH). But, female desire increases 13-15% with one extra hour of sleep. Maybe insufficient sleep is why 26% of couples are hitting the once-a-week mark, with the majority of the respondents reporting sex only once or twice a month, or less⁵.

**Metabolic**

The diabetes epidemic may have to credit sleep as a major partner.

Insulin’s signal to direct glucose into the cell involves getting a receptor (GLUT4) to express on the surface. Insulin has to phosphorylate Akt to get GLUT4 expressed (moved to the cell wall facilitating glucose entry).

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⁵ [https://www.healthline.com/health/baby/how-often-do-normal-couples-have-sex#The-Average](https://www.healthline.com/health/baby/how-often-do-normal-couples-have-sex#The-Average)
With insufficient sleep, the amount of insulin required doubles! Not getting enough sleep suffices to trigger a diabetic trait, insulin resistance. A four hour night decreases our ability to put glucose in muscle. Muscles are, perhaps, our best way to dispose of glucose. We produce insulin in the pancreatic beta cells. Beta cells become less sensitive to glucose signaling during short sleep. This shows impairment to both sides of the blood sugar metabolism equation. It decreases the insulin production side, while the insulin required to act is double. The result is the blood sugar stays high longer, while waiting for the extra insulin required to get it out of the bloodstream into the cells.

We only have about 1 teaspoon of glucose in our bloodstream (or should…). The margin for error here is small. Combine this with decreased PFC activity, our

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food selection deteriorates. With the reasoning portion of our brain offline, consumption of processed/junk food increases at a rate of 30-40% - foods with pronounced and negative impacts on blood sugar. Going from 8 to 5 hours leads to increased caloric intake. A true recipe for disaster.

Hang with me for a minute on this next one, it's worth it.

We have an enzyme called Insulin-degrading enzyme (IDE). Its job is to degrade insulin after its services are complete. Its secondary job is to degrade beta amyloid - the same beta amyloid associated with Alzheimer’s. But, that is secondary. Meaning, if we are constantly challenging IDE with high insulin from high carbohydrate and/or cortisol levels, and/or short sleep, it won’t maintain capacity to degrade beta amyloid.

So, decreased deep sleep increases amyloid, and increased blood sugar also increases amyloid. Put down the soda and get some sleep before your Alzheimer’s risk is out of control!

**Stress**

Stress may make it hard to sleep, but decreased sleep increases the stress hormone cortisol. Short sleep puts the body in a state of stress, so cortisol increases. It drives us to eat more, and we become less sensitive to satiety (fullness) signals. Cortisol has interesting traits; it is anabolic (growth promoting) to fat, but catabolic (breakdown promoting) to muscle. If your fat is increasing, and muscle decreasing, stress is a likely contributor. Seventy percent of under slept individuals lose lean body mass.

Que the chicken vs egg conversation on what comes first - stress or sleep disruptions.

We saw earlier, we throw our gas and brake off with short sleep, leading to emotional reactivity. If we fix that, over reactions to stimuli include more prefrontal cortex (PFC, brake, reasoning). This can help keep cortisol down. While sleep can’t prevent stressors, it can help improve our response.

Elevated cortisol also increases blood glucose, which the previous section explains, can be detrimental long term.
Sleep is a time for the parasympathetic nervous system (attributed to a restful state) to dominate. Stress drives the sympathetic nervous system (fight/flight, excitatory), counteracting the desired state of our nervous system for quality sleep.

**Immune System**

Notice how your sleep drive skyrockets when you come down with an illness? The reason, at least in part, is that sleep integrates with our immune system.

The immune system involves the response to infection, cancer, and participation in the inflammatory process. A four-hour sleep decreases natural killer (NK) cells 70%! NK cells attack and kill cancerous and virus-infected cells. Under slept mice display 200% larger tumors, and more metastases. A 25,000 person European study showed those sleeping less than 6 hours had a 40% increase in cancer. The World Health Organization now classifies night shift work as a carcinogen - easy to see why.

Melatonin, the hormone released at night in response to darkness, we know to have anti-cancer effects. Artificial light at night (ALAN), which reduces melatonin, increases breast and prostate cancer.

Sleep also shows antioxidant properties. Short sleep therefore increases oxidative stress. Oxidative stress and inflammation go hand in hand. Increased inflammation is contributory in most chronic disease, including Alzheimer’s, cardiovascular disease, and cancer.

Researchers have shown vaccines are less effective on insufficient sleep.

Those participants who obtained seven to nine hours’ sleep in the week before getting the flu shot generated a powerful antibody reaction, reflecting a robust, healthy immune system. In contrast, those in the sleep-restricted group mustered a paltry response, producing less than 50 percent of the immune reaction their

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7 https://www.patreon.com/posts/21137176
9 https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.2005206
well-slept counterparts were able to mobilize. Similar consequences of too little sleep have since been reported for the hepatitis A and B vaccines.\textsuperscript{10}

Why? They design vaccines to provoke an immune response. With less sleep, less of an immune response. Get a week’s worth of good sleep before and after your vaccine.

**Cardiovascular**

Cardiovascular (CVD) disease is a known killer - one where sleep plays a critical role.

Insufficient sleep results in a 45\% increased risk of developing and/or dying from CVD. Only getting 5-6 hours results in a 200-300\% increase in calcification, an indicator of vascular injury.

One night of modest sleep reduction leads to an increase in heart rate and blood pressure. As we discussed above, sleep is a time for PNS dominance. With shorter sleep and PNS, the fight/flight system remains in control along with its influence on HR and BP.

Walker has widely used an example publicly of sleep and heart attack. When we shift daylight savings and lose an hour of sleep, heart attacks surge. One Hour. One Weekend. WOW!

**Genetics**

Our genetics are NOT our certain destiny. The study of epigenetics is fascinating to observe. Epigenetics is the presentation of our genes, and the associated traits, are on or off - in at least part of the genome. Some genetic traits are good, others are detrimental long term. The takeaway is that we can exert influence thru our environment, food, and SLEEP!

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A study compared six hours vs eight hours for one week. It changed a whopping 711 gene activities! Down-regulated were many associated with immune function. Up-regulated were those associated with tumor production, long-term inflammation, stress, and CVD.

Want good gene expressions? Sleep is step 1.

Telomeres are chromosomal protectors analogous to the plastic ends of shoe strings - they prevent unraveling of our genetic code. The longer your telomeres, the healthier you are. We promote telomere length with good sleep, degrade them in bad sleep (as I’m sure you guessed I would say).

**Physical Performance**

If you want more out of your gym session, prioritize sleep.

Respiratory Quotient (RQ) is a metric that shows what type of fuel we are burning. A lower number means fat burning, higher means carbohydrate burning from storage.

Sleep deprivation pushes RQ higher. This translates to burning your carb storage (glycogen), of which there is a limited amount. I’m guessing most of us torture ourselves at the gym to burn fat though. Skimping on sleep hurts this cause.

I’ve written before about my reasons for fasting on Tuesdays. Please check out my white paper *Why When You Eat Matters*. One benefit is my sleep stats are remarkably higher. Wednesdays happens to be the most cardiovascular intensive workout of the week in my High Intensity Interval Training (HIIT) schedule. Compared to before fasting on Tuesday, I noticed my performance skyrocket coming in off an extended fast.

Further, as I also write about in *Why When You Eat Matters*, another benefit is a growth hormone (GH) surge after fasting. Sleep deprivation turns GH way down. GH helps build and repair everything from muscle to our vasculature. Decreasing GH from insufficient sleep is a great way to age faster!
Traffic Deaths

Deaths via auto accident have an under appreciated tie to insufficient sleep. Microsleeps are, as the name implies, periods of brief sleep between 1 and a few seconds. These happen as consequence of sleep deprivation. It may not seem like much, but at 70 miles per hour, there is a significant distance traveled - ASLEEP. Walker states, and I agree, micro sleeps are a greater safety issue than driving intoxicated (at least to some degree). At 0.1% blood alcohol your reactions are slowed. At 3 seconds of sleep, it ELIMINATES your reactions.

Four hours for 3 nights translates to a 400% increase in microsleeps - the same as being awake 24 straight hours.

Nineteen hours awake manifests as legal drunk practically. This coincides around bar closing time, a potential double whammy.

Driving on insufficient sleep is highly dangerous. Monitor your sleep stats and adjust your driving plans accordingly.
Sleep Disruptors

Sleep is critically important, but easily disrupted - unfortunately.

Light

Light, and its various subtypes, is a primary circadian rhythm influencer. Most have heard blue light causes issues. Specifically, it suppresses melatonin release. Without this influence, the signals to transition from wakefulness to sleep become muted and benefits missed.

Beyond blue light are two other factors; (1) light spectrum and (2) brightness. Natural light is our model:

The daylight mix above is midday. Dusk and Dawn have more red, less blue. However, most people go from their government recommended non-red light

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bulb in the morning, to LED or fluorescent at work, then back to non-red light in the evening. Practically no variability in brightness, and limited exposure to the natural spectrums.

We should seek bright sunlight during the day, with NO sunglasses. It is a reliable circadian rhythm reset. Further, you are less sensitive to the blue light pollution at night with bright natural light exposure during the day. Sunglasses decrease brightness exposure 7-15 fold. This defeats the purpose of brightness exposure. Since discovering this information in *The Circadian Code* I have only worn sunglasses a handful of times. Another tidbit is to have at least some incandescent bulbs in the house for nighttime use. As you can see above, that red spectrum is much needed.

I know I must do something right in the lighting arena as my neighbors poke fun that our house looks dark every night. I take that as a compliment!

Here is a previous article I wrote on the site; [Blue Light: A Red Alert for Health](#)

**Meal Timing**

Meals at the wrong time are a potent sleep and circadian rhythm disruptor. Since wearing an *Oura ring*, it is perhaps, the most reliable way to tank my sleep score. Eating too much and/or too close to bed causes a certain increased heart rate, decreased *Heart Rate Variability (HRV)*, increased body temperature, and increased respiratory rate. All move physiological conditions away from good sleep. Aim for 2-4 hours, closer to 4 if possible, to finish eating for the day. For many, this is a challenge, but working this rule in has tangible benefits.

**Alcohol**

What about a nightcap? Well, the news may not be great here…

Alcohol is a pronounced REM suppressor. This is a major concern. It also causes sleep fragmentation, or frequent awakenings. This is on top of, or in addition to, increased urination caused by vasopressin (anti-diuretic hormone) suppression.
Walker reports sleep on alcohol looks identical to sleep in Alzheimer's at his lab. Sleep is at least contributory, if not causal, in Alzheimer’s. So, if alcohol makes our sleep like Alzheimer’s, caution ahead.

But what about all those alcohol benefits we hear about? The dose makes the poison, but also timing matters.

One drink likely won’t impact sleep noticeably. Two, for most men at least, is marginal IF too close to bed. Beyond that, watch out.

In my experience with the Oura ring, alcohol beyond two drinks at dinner time *shatters* sleep. Increased HR, decreased HRV, increased respiratory rate, increased body temperature, less REM, and often less deep sleep. Plus the nighttime awakenings. Brutal, especially if combined with a later meal.

### Caffeine

We saw earlier how caffeine helps with alertness. The half-life is 6 hours, and the quarter life 12 hours. Drinking a cup of coffee at 10am leaves a quarter cup worth of caffeine attached to your adenosine receptors around bedtime.

Some people metabolize caffeine faster than others. I haven’t noticed an effect on sleep drinking a cup around 1pm, but that might not be the case for everyone. We can learn a bit about your predisposition to caffeine metabolism by looking at your genetics thru services such as 23andme. I try to stop coffee before noon, but it is likely advisable to quit earlier.

### Temperature

Sleep accompanies a decrease in core body temperature. Anything we do that opposes the ability to offload sufficient heat disrupts sleep. We saw above, eating too much, too close to be, and alcohol, shoots up my body temperature. There is a thermogenic effect from consuming food. Eating causes a metabolic increase, and temperature goes up.

Melatonin also decreases body temp, so the light issues discussed above can hinder our temperature regulation as well.
Exercising too hard, too close to bed can keep body temperature elevated, preventing quality deep sleep which occurs in the first half of the night. Beyond these issues, we turn to the bedroom. Room temperature is ideal in the mid-60s. Further, too much bedding or clothing can prevent sufficient cooling. Birthday suit? Then, there is the body heat of your sleeping partner. Any of these can tank your sleep if unmanaged.

Don’t worry, I have an amazing solution I the strategies section. But ok, here is a subtle hint: the Chilipad is awesome for bed temperature regulation - even against the bedroom challenges just discussed.

Sleep Apnea

Sleep apnea is when you stop breathing, many times during the night. It is beyond snoring, though they likely occur together, and snorers will be a higher risk. I have seen many sleep studies of people who have this condition. It is scary. Watching the almost countless number of times they stop breathing, and what stress that places on the heart - makes me sick.

Sleep apnea will shorten your life, take measures to fix it ASAP. Losing weight is the first step often, but many will need some kind of strategy such as CPAP while they address the cause.

Please, do NOT delay.

Rx & OTC Sleeping Meds

Yes, this is in the disruptors section.

Hypnotics, such as Ambient (zolpidem), Lunesta (eszopiclone), and older benzodiazepines such as Valium (diazepam), and Ativan (lorazepam) can effect consciousness - sleep though is debatable.

Walker shows us that the electrical signature of sleep is very different. Markedly decreased is the slow waves found in deep sleep. Researchers found Ambien induced caused a 50% weakening or unwiring of brain cell connections for learning. That, coupled with what we learn above, where memories become
cemented during deep sleep, suffices to conclude memory and Ambien are not compatible.

Dr. Daniel Kripke discovered those use prescriptions slip aids were more likely to die and develop cancer. They were 4.6 times more likely to die over a period of less than three years. One mechanism is from an increasing rate of infection. This ties to the immune relationship to sleep described earlier - and ties to cancer the same way.

All this show that these meds degrade sleep physiology while aiding in decreasing consciousness.

Two quick additional mentions.

Trazodone is an older antidepressant that works on serotonin in part. They use it more for sleep than as an antidepressant today. This is a better choice than Ambien - for sure - but less than advisable on a continual basis. There is experimental evidence linking the mitochondrial effects of sertraline and trazodone to the relatively rare but serious adverse effect of hepatotoxicity (Li et al., 2012; Taziki et al., 2013). Continue reading for better alternatives.

Prazosin is a blood pressure medication used in psychiatry for its calming qualities. It can increase REM, which as we saw above, is beneficial for mood and anxiety. This may be a useful agent in an acute setting where a bout of major anxiety has disrupted sleep. Same advice as for trazodone though, this should not be part of a long-term regimen.

Benadryl (diphenhydramine) and similar sedating antihistamines can be very effective and inducing drowsiness. Long term though, they can increase the risk of dementia. This suggests that while effective at causing drowsiness, they also downgrade normal sleep architecture that promotes brain health. Further, the anticholinergic effects of these medications can lead to urinary retention and other effects, especially in the elderly. Most PM meds over the counter (ie Advil PM) contain this class of antihistamine. A few doses won’t cause harm in most people, but don’t reach for these like sleeping vitamins - you will find trouble.

12 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4592307/
Strategies

I have been experimenting with many sleep improvement strategies most heavily since I got an Oura Ring in November 2017.

Let’s start there. I highly recommend this ring, or another tracker, that measures the following:

- Heart Rate
- Heart Rate Variability
- Respiratory Rate
- Body Temperature
- Time in Bed
- Sleep Time
- Stages: Deep, REM, and light

The stages on devices available are not as accurate as with sleep lab technology. But, they are consistent so you can use them to gauge changes. If you normally get an hour of deep and the next night get 15 minutes, it is reasonable to chase down what contributed to the decrease.

Periodically, Oura ring sends coupon codes to existing users for sharing. I will send those to everyone on our email list (input box on the homepage).

To see how effective any of these strategies are, the Oura ring is valuable. I can attest to the effectiveness of what is below in my experience, but nothing trumps personal data.

Free

Free is the best, and often most effective. Before adding supplements or solutions that cost, its always best to start with the basics.

Establish a solid circadian rhythm:

- Consistent bedtime and awakening time.
- Cool room, about 65 degrees
• Bright light during the day, very dim and non-blue-light at night
• Dark, pitch black bedroom. Cover all LED indicator lights on various devices. If this isn’t possible, consider an eye mask (even though, not free)
• Phone on airplane mode.
  • If you can’t ignore calls, forward them from your cell to the landline. If this isn’t an option, at least turn off all notifications, including the vibrate.
• Warm or cold shower
  • warm bath or shower will cause heat to leave the skin, resulting in a decreased body temp
  • cold shower, not for too long, can also help, especially if coming off of a workout. Too long in the cold will cause your body to crank up internal heat production.
• Stop eating 2-4 hours before bed. 4 hours is superior though.
• Get a sufficient amount of sleep. Eight hours may not be the magic number for everyone. In fact, a study cited often by Dave Asprey (most recently in his new book Super Human) found that people who slept 6.5 Horus lived the longest and those who slept 8 hours died more from any cause\(^\text{13}\).
  • I average just shy of 7 hours nightly (6hr 55min). When I sleep longer, I often don’t feel as good. But, I have dialed in my sleep quality - I hit my deep and REM targets in that amount.
  • What to do? Focus on sleep quality. Your number will vary. Implement these strategies, and maybe a few from the following pages. Allow a sleep opportunity (time in bed) that will allow a minimum of 6.5 hours of sleep. Most people don’t sleep the whole time though. Give space on either side, say an hour total. Can you get a 7.5 hour sleep window? If you still are hitting the alarm clock, expand or shift your sleeping window (go to bed earlier). My eyes pop open around 5:15 every day. If I want to get good sleep I need to be sleeping by 10p.

\(^{13}\) https://www.ncbi.nlm.nih.gov/pubmed/11825133
Chilipad or Ooler

- The absolute best hack for optimizing temperature is called Chilipad. This system runs water thru a mattress pad at the precise temperature you set (there are dual zones for bigger beds). I set mine to 55 degrees, but it goes up over 100 degrees. Cool sleep is the best sleep, and this helps my temp remain ideal. It made an immediate and lasting effect on my sleep tracker. I have the original Chilipad model, they now have a fancier one with more smartphone features (Ooler). Get one today!

- When I am traveling away from my Chilipad, my body temp is around 0.2 - to 0.5 degrees higher. That may not sound like a lot, but it is a significant portion of the drop your body is expecting to transition to good sleep.

I cannot recommend this enough!

Blue Light Management
Reducing blue light, and all light brightness is essential in the hours leading up to bed.

- I have tried a few blue light blocking glasses, but the ones I like best are called True Dark.
- For screens, you can enable blue light reductions on your phone. For your computer there is f.lux and an app with more features called Iris.
- You can read a bit more about blue light in this article, Blue Light: A Red Alert for Health.
- driftTV is a device that will filter blue light from your TV. It sits in between your content sources (cable box, DVD, etc).
- Philips Hue lights can manipulate light spectrum emitted. For example, you could light your living room or bedroom in red light.

**Pro Tip**

Blue light suppresses melatonin. Melatonin decreases insulin production (so you don’t have a blood sugar crash during sleep). Blocking all blue light during dinner, is not advisable. We want normal insulin function with meals. Reach for those blue blockers a while after dinner, and for those candlelight dinners, go easy on the carbs.

**Supplements**

I have tried a number of combinations, but these are my current favorites. I will list individually, but there is a way at the end to get these benefits in one convenient package!

**Melatonin**

This hormone is critical. It has anti-inflammatory and anti-cancer properties. It is the primary signal to begin our sleep session thru light exposure sensing. Blue light is everywhere. It is hard to avoid. Supplemental melatonin helps us
recover from exposures. Aside from light problems, melatonin is excellent for travel and those over 50 as we tend to produce less as we age. Further, it can help promote a decrease in body temperature.

The dose range is around 0.3mg - 3mg. Higher doses can be used under guidance for certain scenarios, including cancer. Pure Encapsulations is a reliable brand with various dosages.

**Glycine**

Glycine is an amino acid found in collagen. It has calming properties, as well as thermoregulating benefits. Since we eat mostly muscle meats, and not collagen rich connective type tissues, many Americans are deficient in glycine. Now has an economical 1 gram dose, I take 3 grams.

**Phosphatidylserine**

PS for short, is know to oppose cortisol, the stress hormone. As we saw earlier, and undoubtedly you have experienced, stress is major sleep antagonist. Dose range is in the 100-400mg area, start on the lower side, and increase with guidance - a variety of doses are available here.

**Magnesium**

Magnesium is involved in around 700 biochemical reactions throughout the body. It also can have a calming effect. Many of us are deficient in magnesium. Due to modern farming practices, much of the soil can’t provide enough to plants. We could all use some magnesium supplementation it seems. I like the product ReMag, a highly available liquid form that doesn’t cause loose stools in high doseages. I noticed it helped my muscles post workout as well, and eliminated the need to use epsom salt baths (Another great source of magnesium).

**L-Theanine and GABA**

This is a compound that promotes relaxation. It increases a calming substance

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14 [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4397399/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4397399/)

15 [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2503954/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2503954/)
called GABA, lowers excitatory transmissions, and increases alpha waves (they are found in REM).

GABA is what Ambient and Valium target, but by interacting with the receptor. We can supplement GABA, which doesn’t have the associated issues that go with receptor modulation.

You can get both GABA and L-Theanine individually, and they can be used for other calming scenarios outside of sleep - they don’t cause pronounced drowsiness. I also like this combo, 200mg of Zen, which contains both - great for needed relaxation, say after a Seahawks-49ers game, or just when you need a little more calm.

Ashwaghanda

This is in a class called stress adaptogens - they help our body manage the stress response better. Following with the theme that stress kills sleep, this agent has been widely used world wide with good results. It also has the benefit of improving testosterone levels16.

**Doc Parsley’s Sleep Remedy - A combination of the above supplements**

I have not personally used this combination because I like experimenting with different doses based on the day. But, if you want to hit all the points discussed above, this is the best place to start. The only one it doesn’t have is Ashwagandha. I came to this supplement combination after much trial and error, and didn’t know about Doc Parsley’s until I heard about it from other people really into sleep. I highly recommend starting with this supplement if you want to try these strategies without managing a bunch of pill bottles.

16 [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6438434/]
Synapsin - Deep Sleep Master

Synapsin is a product we compound into a nasal spray at Island Drug. I have found it to be a potent deep sleep escalator. Below is content from an article I posted on the site Deep Sleep Doubled.

My wife

So, living with me means exposure to lots of new things to try on the health front, including sleep hacks (to which the response would be best summed up with an eye roll emoji).

She has not had the success I have on improving deep sleep, despite implementing most of the same tactics above. Her 2018 average was 47 minutes – not terrible, but not optimal.

Then, a couple weeks ago she began using a new product from Island Drug’s compounding lab called Synapsin. The last 11 days her deep sleep has doubled to an average of 95 minutes. WOW. We made no other changes, just this new product.

Her deep sleep went from an average for 47.6 minutes for 2018 to an average of 95.5 minutes in the last 11 days. DOUBLED!
We have other patients without an Oura ring also reporting more restful sleep. A few more with Oura rings plan to use Synapsin and we will keep tabs on that data.

**Synapsin**

Below is an excerpt from a recent email update to Island Drug customers: 

3 New Products | Excellent Reported Outcomes

Synapsin is an innovative, patent-pending powder blend of ginsenoside Rg3 and nicotinamide riboside along with components to aid in solubilization and dispersion. It is an ingredient designed to be used in dietary supplement formulations for the support of neurological health and cognitive health.

**NUTRIENT SUPPORT SUMMARY OF SYNAPSIN**

Supports neuronal health

Supports NAD+ production in the central and peripheral nervous system, and supports health sirtuin expression

Supports healthy mitochondrial function

Supports the attenuation of microglial activation

Jim LaVelle (a pharmacist!) is the developer of Synapsin; this is a listing of conditions referenced for this product on his website:

Traumatic Brain injuries (and impaired cognitive function) can be seen in many types of people:

- NFL players with concussions
- Navy Seals after being in combat zones
- Motor Vehicle Accident
- Electric shock
- Violence injury
- Diseases:
  - Diabetes
  - Parkinson’s
Alzheimer’s (Dementia)  
Autism Spectrum Disorder  
ADHD Autoimmune Disorders  
ALS (Lou Gehrig’s Disease)  
Lyme Disease  
Mold  
Stroke  
TIA  
Chronic Stress Situations  
Executive Burnout  
Lifestyle Stress  
Overloaded mom with the Jello brain feeling

We have seen particularly good experiences in the overloaded mom category, executive burnout, and sleep improvement.

This product is included, along with a host of other strategies to combat brain inflammation, in an expansive (and free) 20+ page whitepaper.

**Mechanism of Action for Deep Sleep**

In the studying of Synapsin I did before we used it in patients, it was all about neuroinflammation (inflammation in the brain), but didn’t include sleep insights. The information was powerful, and mechanistically made sense. Inflammation consumes cellular energy resources, and the products in Synapsin help the mitochondria (energy producing cellular organelles) to work better. More energy is an asset without question.

With deep sleep, my theory is chronic neuroinflammation contributes to a decreased capacity to sustain proper sleep, in part due to the energetic deficit. Sleep is NOT a passive low activity state – there are lots of processes going on during shuteye.

After learning about the glial cells, and their need to shrink during deep sleep to wash toxins away via the glymphatic system, another dot was connected. The Rg3 ingredient supports health microglial activity. So, along with decreasing inflammation, it supports the glial function necessary during deep sleep.

Powerful!
Parting Thought on Synapsin

This intervention was powerful. Doubling deep sleep has enormous benefits in the short and long terms. I have seen over the last 18 months how finicky it can be to enter deep sleep, and for this one product to deliver such a substantial impact is amazing. Yes, it is an n=1 study. However, it was very well controlled. The only change was adding Synapsin.

My takeaway here is that (1) Synapsin helped and (2) brain inflammation takes part and is under appreciated. As laid out in the Inflamed Brain Whitepaper, it can manifest in a variety of ways – brain fog, depression/anxiety, cognitive decline, and more. Here, she experienced the normal full-time job and mom lifestyle of running full speed. Likely, low grade brain inflammation had developed that the Synapsin helped knock down.

What kind of undetected brain inflammation levels might someone have with diagnosed depression, anxiety, or dementia have? Would Synapsin + the other information in the whitepaper help?

Synapsin is a prescription item

Please contact me for assistance on how Synapsin is prescribed. It is compound at Island Drug, we can work with your doctor if interested.

Summary

If you want to live longer, perform better, and feel better, sleep must be prioritized.

The last few years have been extremely eye opening (counter pun?) as I took a deep dive in sleep physiology.

Our society is under slept. Not just hours, but quality.

We can walk back these deleterious effects with a little knowledge, effort, and prioritization. It's never easy implementing changes opposite of mainstream. But, the mainstream is getting bad sleep while getting sicker and sicker - and we saw above these sicknesses relate to sleep problems.

I recommend implementing everything in the free section above. In addition,
the **Chilipad/Ooler, Doc Parsley’s Sleep Remedy, True Dark glasses** for junk light protection, and Synapsin have proven to be highly effective ways to improve sleep quality. Start today!
Prescriptive Optimization is a Health Coaching Service provided by Island Drug. For more information, please visit PrescriptiveOptimization.com/service

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