

Sleep Toolkit: Tools for Optimizing Sleep & Sleep-Wake Timing | Huberman Lab Podcast #84

In this episode, I describe a comprehensive toolkit consisting of behavioral and supplement-based tools that you can customize to enhance the quality, duration and impact of your sleep. This has an enormous positive impact on your overall health and daytime functioning, brain, hormones and immune system. I teach you how to effectively harness light (and darkness), temperature, food, exercise, caffeine, supplements, and digital devices in order to fall asleep faster, stay deeply asleep longer and overall, and achieve better quality sleep. I also describe how these tools can be modified to recover quickly from a poor night's sleep, jet lag or bouts of shift work. Given that sleep is the foundation of all mental health, physical health and performance, this episode should benefit everyone as it provides an essential toolkit of science-supported, low- to zero-cost strategies that can be tailored to optimize your sleep routine.

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- Welcome to The Huberman Lab Podcast, where we discuss science and science-based tools for everyday life. [bright music] I'm Andrew Huberman and I'm a professor of neurobiology and ophthalmology at Stanford School of Medicine. Today we're talking all about sleep and how to optimize your sleep. This is a topic we've covered previously on this podcast in the episode called "Master Your Sleep." However, since the airing of that episode, there's been some terrific new science to come out. I've also received

thousands, yes, literally thousands of questions related to the specific protocols covered in that episode as well as in the episode on jet lag and shift work. And while today's episode is not specifically about jet lag and shift work, we are going to cover tools that will allow you to shift your schedule if you need to for work or travel, and we will also cover tools that will allow you to fall back asleep if you happen to wake up in the middle of the night or if you get a poor night's sleep, how to actually recover from that poor night's sleep more quickly, and yes, indeed, even replace sleep that you've lost. So today's episode is going to be filled with practical tools. We will touch on some of the underlying science, but it's really designed to be a practical toolkit for optimizing your sleep depending on your specific sleep needs. Various times throughout today's episode, I will refer to studies that form the backbone of the tools that I'll be describing. But whereas most of the podcast episodes here tend to be deep scientific mechanism and then tools, scientific mechanism, then tools, today I'm mainly going to focus on the practical tools that anyone, indeed, all people, I believe, should use in order to optimize their sleep. Why should everybody want to optimize their sleep and put considerable effort into optimizing their sleep? Well, put simply, sleep is the foundation of mental health, physical health, and performance of all kinds, cognitive performance, physical performance, et cetera. It also controls things like our immune system, wound healing, our skin health and our appearance, whether or not we can think clearly or not, whether or not we will live as long as we possibly can or not, whether or not we suffer from dramatic age-related cognitive decline or not. In other words, whether or not we keep our memory as we age. I could go on and on about all the terrible things that can happen to somebody if they don't sleep well. Thanks to the great work of Professor Matt Walker at University of California, Berkeley, and the wonderful book that he wrote, "Why We Sleep," I think the world is largely onboard now that sleep is critical to our health, our mental health, our physical health, and our performance, but what's not often discussed is how great life is, that is, how much more focused and energetic and how positive our mood gets, when we are sleeping for the appropriate amount of time at the appropriate depth and when we are doing that regularly. Basically everything in life gets better when we're sleeping well. So today I'm going to teach you the tools that will allow you to optimize your sleep. That is, get to sleep and stay asleep, fall back asleep if you wake up in the middle of the night,

00:03:02 Momentous Supplements

and adjust your sleep given the various life demands you may be experiencing. I'm pleased to announce that The Huberman Lab Podcast is now partnered with Momentous supplements. We partnered with Momentous for several important reasons. First of all, they ship internationally, because we know that many of you are located outside of the United States. That's valuable. Second of all, and perhaps most important, the quality of their supplements is second to none, both in terms of purity and precision of the amounts of the ingredients. Third, we've really emphasized supplements that are single-ingredient supplements and that are supplied in dosages that allow you to build a supplementation protocol that's optimized for cost, that's optimized for effectiveness, and that you can add things and remove things from your protocol in a way that's really systematic and scientific. This is really hard to do if you're taking blends of different supplements or if the dosages are such that you can't titrate, or that is, adjust the dosages of a given supplement. So by using single-ingredient supplements, you can really build out the supplement kit that's ideal for you and your specific needs. If you'd like to see the supplements that we partner with Momentous on, you can go to livementous.com/huberman. There you'll see those supplements. And just keep in mind that we are constantly expanding the library of supplements available through Momentous on a regular basis.

00:04:16 InsideTracker, Eight Sleep, LMNT

Again, that's livementous.com/huberman. Before we begin, I'd like to emphasize that this podcast is separate from my teaching and research roles at Stanford. It is, however, part of my desire and effort to bring zero-cost-to-consumer information about science and science-related tools to the general public. In keeping with that theme, I'd like to thank the sponsors of today's podcast. Our first sponsor is InsideTracker. InsideTracker is a personalized nutrition platform that analyzes data from your blood and DNA to help you better meet your health goals. I've long been a believer in getting regular blood work done for the simple reason that many of the factors that impact your immediate and long-term health can only be analyzed from a quality blood test. And nowadays, with the advent of modern DNA test, you can also get insight into, for instance, what your biological age is and compare that to your chronological age. And, of course, your biological age is really the age that counts. The problem with a lot of blood tests and

DNA tests out there, however, is that you get information back about the levels of metabolic factors, lipids, hormones, et cetera, but you don't know what to do with that information. InsideTracker makes that all very easy to navigate. They have a personalized platform. So this is a web portal where you can go, you'll see the numbers from your blood tests and DNA tests, and then it will tell you, for instance, how you could adjust various aspects of your nutrition or your exercise or supplementation in order to bring those numbers into the ranges that are best for you. If you'd like to try InsideTracker, you can go to insidetracker.com/huberman to get 20% off any of InsideTracker's plans. That's insidetracker.com/huberman to get 20% off. Today's episode is also brought to us by Eight Sleep. Eight Sleep makes smart mattress covers with cooling, heating, and sleep tracking capabilities. It turns out that your body temperature and your ability to fall and stay asleep are very closely related. If your body does not drop by one to three degrees, you are simply not going to get into deep sleep or stay in deep sleep. And waking up, it also turns out, is related to body temperature. Every time you wake up in the morning, your body is warming up in order to wake you up, and this has an enormous number of hormonal and metabolic and other cascades that are vitally important, not just to what happens while you sleep, but your health and your energy and focus throughout the day. Eight Sleep is an incredible device. It's one that I've been using for six months or so, and it's completely transformed my sleep. And I already thought I was sleeping pretty well. The way it works is that you can cool or heat your mattress according to different times throughout the night. So for instance, you can cool your mattress if you tend to run warm and that will help you fall and stay deeply asleep and then toward morning, you can have the mattress programmed or, I should say, the mattress cover programmed, so that you warm up your sleeping environment and you wake up when you want to wake up. If you've been sleeping pretty well but waking up in the middle of the night, you might also find that by cooling your mattress even further toward the middle of your sleep about, well, you'll stay in deep sleep much longer. If you'd like to try Eight Sleep, you can go to eightsleep.com/huberman to check out the Pod Pro Cover and save \$150 at checkout. Eight Sleep currently ships within the US, Canada, and the United Kingdom. Again, that's eightsleep.com/huberman to save \$150 at checkout. Today's episode is also brought to us by LMNT. LMNT is an electrolyte drink that has everything you need in order to get your brain and body to function at its best, but none of the things you don't, in particular, sugar. Electrolytes are vitally important to the way that your neurons, your nerve cells, work and, indeed, to the

way that all the cells of your body work. But your nervous system and your neurons particularly depend on electrolytes because you need the electrolytes, sodium, magnesium, and potassium, in the proper ratios, in order for those nerve cells to fire what are called action potentials, which are the electrical signals that allow your neurons to work and to allow you to do everything from remembering information to moving your muscles deliberately. When you exercise, or even if you don't, you can get quite low on electrolytes, especially on a hot day. You can get dehydrated. There are a lot of different ways to replenish your fluids and electrolytes and there are a lot of different electrolyte drinks out there, but many of them contain a lot of sugar. And some of those that don't contain a lot of sugar don't have the proper ratios of sodium, magnesium, and potassium. If you'd like to try LMNT, you can go to drinklmnt.com/huberman to claim a free LMNT Sample Pack with your first purchase.

00:08:24 Factors to Control Circadian Rhythm & Sleep

Again, that's drinklmnt.com/huberman to claim a free sample pack. Let's talk about sleep and tools to optimize your sleep. I want you to conceptualize yourself as contained within a room that has only very few windows or very few entry points. What do I mean by this? Well, your brain and your nervous system control whether or not you move or don't move. They control whether or not you're digesting food or you're not digesting food. They control whether or not you're stressed or not stressed, happy or sad, et cetera. All of that stuff that controls all that stuff is housed inside your skin and skull, et cetera. That might seem pretty obvious, but what that means is that for your brain and body to feel alert and focused, ready to move and exercise or do some work, or if your brain body are going to lie down and go to sleep, well, that brain and body needs cues, it needs inputs, to determine when to do those different things. And those cues and inputs arrive through a defined set of what I'll call stimuli, but you can also think of these as levers or tools. The main levers and tools that are going to allow you to control when you are awake and when you are asleep and to get better sleep every single night are light, literally photons, light energy, could be from sunlight, could be from artificial light, we will discuss those particulars in a moment, as well as darkness. That is the absence of light. So we've got light and dark. Those are two very powerful tools to encourage your nervous system to be in one state or another, meaning awake or asleep. Temperature is another tool or lever. Turns out that when your body is cooling down, you have a greater

tendency to fall and stay asleep. In fact, every night when you actually sleep, your body is dropping by one to three degrees and that drop in temperature is required. It's like a gate that your body has to go through in order for you to get into sleep. And in fact, the converse is also true. If your body heats up by one to three degrees or so, you will wake up. So you've got light, dark, temperature, food. And when we say food, we mean what we eat, when we eat, and the amount that we eat. Okay, so light, dark, temperature, food, exercise. And of course, exercise comes in different forms. We can do cardiovascular exercise that can be low-intensity, long-distance exercise. It can be high intensity, so-called high intensity interval training. It could be weight training. It could be yoga. It could be swimming, any number of different activities. But exercise, in general, causes an increase in body temperature and tends to make us more alert, not just during the exercise, but in the immediate hours after that exercise. Exercise does some other things that relate to our sleep as well and we'll talk about those today and how you can leverage them. Another potent lever for adjusting your sleepiness and wakefulness is caffeine. This, of course, comes as no surprise to people, but why and how caffeine works might come as a surprise. Very briefly, we have a molecule in our body called adenosine and the longer we have been awake, the more adenosine builds up in our brain and body and adenosine is part of the reason why we get sleepy. Caffeine effectively operates as a adenosine antagonist. It works by basically occupying the receptor for adenosine. So it's a little bit of a convoluted mechanism. But basically all you need to know is that caffeine prevents the actions of adenosine. That's one of the reasons why caffeine makes us feel alert. But how much caffeine we drink and when we drink caffeine turns out to be vitally important for adjusting our wakefulness and for optimizing our sleep. So we'll talk about that as well. The other category of lever or tools which are immensely powerful for optimizing sleep are supplements. There now exist as many as eight different supplements that can powerfully modulate sleep in healthy ways and that have huge margins for safety. So we're going to talk about what those supplements are. In previous episodes of this podcast and as a guest on other podcasts, I've talked about three particular supplements, magnesium threonate, apigenin, and theanine, which together can really enhance the speed at which one falls asleep and people's ability to stay asleep and to really get into those deep stages of sleep that are particularly restorative. Today we're going to talk a little bit more about each of those three and how they can best be used in combination, but we are also going to touch on some other supplements that I have not talked about much before, if at all. Things like

glycine and GABA, as well as inositol. Many people are going to find inositol interesting and of particular use to them, especially if they're following a low-carbohydrate diet or if they are fasting before sleep or just trying to avoid eating too close to bedtime and yet they're having a hard time falling asleep. Inositol also turns out to be especially useful for people who have a tendency to wake up in the middle of the night and have a hard time falling back asleep. It also has some interesting and potent effects on anxiety throughout the day. So we're going to talk about inositol as a tool as well. And then last in our list of general categories of levers and tools for optimizing sleep are digital tools. Now, when we say digital tools, I don't necessarily mean devices. What I mean are things like non-sleep deep rest scripts. These are zero-cost scripts that you listen to that take your body through some deep relaxation and that can help people both fall asleep, stay asleep, fall back asleep, and get better at sleeping. And also going to talk about digital tools related to self-hypnosis. This is distinctly different from stage hypnosis. So I know some of you hear hypnosis and you think, oh, you know, people clucking like chickens and doing things that are outside their control. That's not at all what I'm referring to here. I'm talking about clinically and research-supported tools that have been shown to enhance people's ability to fall and stay asleep and that can get you far better at sleeping. So again, to recap the list of levers and tools, we've got light and dark, and that includes the intensity of light, the timing of light, et cetera. We've got temperature. We have food. We have exercise, caffeine, supplements, and digital tools, not just limited to devices, but zero-cost tools that you can access on YouTube and elsewhere in various apps that can really help you optimize your sleep. So today we're going to talk about all of these. I really want to provide you as many tools as possible, give you the logic behind each of those tools and when and how best to apply them

00:15:10 Morning Tool: Morning Sunlight Viewing, Cortisol

so that you can develop the sleep toolkit that's ideal for your sleep needs. As we head into our description of tools for optimizing sleep, let's consider what the perfect 24-hour cycle would look like. Let's start this 24-hour cycle with when you wake up in the morning. So for some of you, that will be 5:00 a.m. For others of you, that will be 10:00 a.m. Most people, I believe, wake up sometime between 6:30 a.m. and 8:30 a.m. But regardless of when you wake up in the morning, one of the first things that happens is that your body temperature is increasing and that's just going to happen naturally. Some

of it is going to be the consequence of your moving around a bit, but really the increase in body temperature is one of the main triggers for why you woke up in the first place. That increase in body temperature in turn causes an increase in the release of a hormone called cortisol. Cortisol is often discussed as a stress hormone, but it's not just associated with stress. It also enhances your immune system provided cortisol is elevated at the right times, and the right time for cortisol to be elevated is when you first wake up in the morning. That increase in cortisol is also going to increase metabolism. It's also going to increase your ability to focus mentally and for you to move your body. So again, cortisol is often demonized and considered this bad thing. And indeed, you don't want cortisol to be chronically or consistently elevated throughout the day or night. But you do want cortisol to reach its peak early in the day right about the time you wake up. One way that you can ensure that that cortisol peak occurs early in the day right about the time that you wake up is to view bright light, ideally from sunlight, within the first 30 to 60 minutes after waking. That's right, view bright sunlight within the first 30 to 60 minutes after waking. I'll get into all the caveats about what happens if you wake up before the sun is out, what if you live in the UK where there is no sun, or people claim there is no sun. Hate to tell you this, folks, but there is sun in the UK. We'll talk about all that. But everybody, whether or not you live in a cloudy place or a sunny place, whether or not there's cloud cover or not that day, should really strive to get bright light in your eyes, ideally from sunlight, within the first 30 to 60 minutes after waking. The reason for that is very simple. You want to trigger that cortisol increase to occur very early in your day, and you don't want that cortisol peak to happen later, which is what will happen if you wait to get outside and see sunlight. The reason for this is that you have a set of neurons, nerve cells, in your eye. They're called intrinsically photosensitive melanopsin cells, but you do not need to know that name. Those neurons respond best to bright light, and especially right after waking early in the day, they are best able to signal to a set of neurons that reside over the roof of your mouth called the suprachiasmatic nucleus, which is a cluster of neurons that then sends a huge number of other signals, electrical and chemical, out to your entire body that triggers that cortisol increase, provides a wake-up signal for your brain and body, and sets in motion a timer for you to fall asleep later that night. So again, we're not trying to go into too much mechanism today. We are trying to really hammer on tools and I'll substantiate those tools just a bit with some mechanism. But here's what you do, or at least here's what I do. I wake up in the morning and I want to reach for my phone, but I know that even if I were to crank up

the brightness on that phone screen, it's not bright enough to trigger that cortisol spike and for me to be at my most alert and focused throughout the day and to optimize my sleep at night. So what I do is I get out of bed and I go outside. And if it's a bright, clear day and the sun is low in the sky or the sun is, you know, starting to get overhead, what we call low solar angle, then I know I'm getting outside at the right time. If there's cloud cover and I can't see the sun, I also know I'm doing a good thing because it turns out, especially on cloudy days, you want to get outside and get as much light energy or photons in your eyes. But let's say it's a very clear day and I can see where the sun is. I do not need to stare directly into the sun. If it's very low in the sky, I might do that because it's not going to be very painful to my eyes. However, if the sun is a little bit brighter and a little bit higher in the sky, sometimes it could be painful to look at. So the way to get this sunlight viewing early in the day is to look toward the sun. If it's too bright to look at directly, well, then don't do that. You just look toward it, but not directly at it. It's absolutely fine to blink. In fact, I encourage you to blink whenever you feel the impulse to blink. Never look at any light, sunlight or otherwise, that's so bright that it's painful to look at 'cause you can damage your eyes. But for this morning sunlight viewing, it's best to not wear sunglasses, that's right, to not wear sunglasses, at least for this morning sunlight viewing. It is absolutely fine to wear eyeglasses or contact lenses, so-called corrective lenses. In fact, those will serve you well in this practice or this tool because they will focus the light onto your neural retina and onto those melanopsin intrinsically photosensitive ganglion cells. If your eyeglasses or contact lenses have UV protection, that's okay. There's so many different wavelengths of light coming from the sun and they are bright enough that they will trigger the mechanisms that you want triggered at this early time of day. So try and get outside, ideally within the first five minutes of waking

00:20:44 Morning Sunlight: Circadian Rhythm, Artificial Lights, Cloudy Days

or maybe it's 15 minutes, but certainly within the first hour after waking. I want to share with you three critical things about this tool of morning sunlight viewing. First of all, this is not some woo biology thing. This is grounded in the core of our physiology. There are literally hundreds, if not thousands, of quality peer-reviewed papers showing that light viewing early in the day is the most powerful stimulus for wakefulness throughout the day and it has a powerful, positive impact on your ability to fall and stay asleep at night. So this is really the foundational power tool for ensuring a great night's sleep and for

feeling more awake during the day. Second of all, if you wake up before the sun is out, you can, and probably should, flip on artificial lights in your internal home environment or apartment or wherever you happen to live if your goal is to be awake, right? If you wake up at four in the morning and you need to be awake, well, then turn on artificial lights. Once the sun is out, however, once the sun has risen, then you still want to get outside and view sunlight. Some of you will wake up before the sun comes out. And if you're asking whether or not turning on artificial lights can replace sunlight at those hours, unfortunately, the answer is no. Unless you have a very special light, and we'll talk about what kind of light, the bright artificial lights in your home environment are not, I repeat, are not going to be sufficiently bright to turn on the cortisol mechanism and the other wake-up mechanisms that you need early in the day. The diabolical twist, however, is that those lights in your home or apartment or even on your phone are bright enough to disrupt your sleep if you look at them too late at night or in the middle of the night. So there's this asymmetry in our retinal, our eye biology, and in our brain's biology, whereby early in the day, right around waking, you need a lot of light, a lot of photons, a lot of light energy, and artificial lights generally just won't accomplish what you need them to accomplish. But at night, even a little bit of artificial light can really mess up your so-called circadian, your 24-hour clocks, and all these mechanisms that we're talking about. So if you wake up before the sun is out and it's still dark, please turn on as many bright artificial lights as you possibly can or need, but then get outside once the sun is out. On cloudy days, you especially need to get outside. I repeat, on cloudy days, overcast days, you especially need to get outside and get sunlight. You just need to get more of it. Now, how much light and how much light viewing do you need? This is going to vary depending on person and place, literally where you live on earth, whether or not there's a lot of tree cover, whether or not you're somebody who has sensitive eyes or less sensitive eyes. It's really impossible for me to give an absolute prescriptive, but we can give some general guidelines. In general, on a clear day, meaning no cloud cover or minimal cloud cover, you want to get this sunlight exposure to your eyes for about five minutes or so. Could be three minutes one day, could be seven minutes the next day, about five minutes. On a day where there's cloud cover, so the sun is just peeking through the clouds or it's more dense cloud cover, you want to get about 10 minutes of sunlight exposure to your eyes early in the day. And on days that are really densely overcast or maybe even are rainy, you're going to want to get as much as 20 or 30 minutes of sunlight exposure. Another key thing is do not, forget about, just don't try and

get this sunlight exposure through a windshield of a car or a window, whether or not it's tinted or otherwise. It takes far too long. It's simply not going to trigger the relevant mechanisms. You would be standing there all day trying to get enough light into your eyes from the morning sunlight and by then the sun will have already moved from low solar angle to overhead and it simply won't work for all sorts of mechanisms related to your circadian rhythm functions. So just don't try and do it through a windshield, sunglasses, or a window. It's just not going to work. Get outside. If the weather is really bad or for whatever reason, safety reasons, you cannot get outside, well, then I suppose try and get near a window. That would be the last, last resort. But you really want to get outside to get this sunlight exposure. Now, if you live in a part of the world where it's extremely dark and overcast or the weather won't let you outside or you live in a cave or some other small box that does not allow any natural light into it for whatever reason, well, then you're going to need a replacement for that sunlight. And there are sunlight simulators or daylight simulators that you can purchase. Those are quite expensive in general and therefore I suggest cheaper options that work just as well because they get just as bright. Things like ring lights that are sold in order for people to take selfies and this kind of thing. A drawing LED tablet will work pretty well. I actually have one of those and I put it on my desk all morning even though I still get outside and look at sunlight first thing in the morning, again, also, especially, I should say, on cloudy days. We do not have any affiliation to any ring lights or LED lights or these panels. So we will provide a link to a couple of different options if you want to explore the various options. I don't know what people's different budgets are. I don't know where people live. I just know that many of our listeners live in locations throughout the world where, for instance, during the winter, it gets very, very dark, so they can't get sufficient sunlight. But get that morning light, ideally from sunlight, and take into account all the specific points that I've given you here. And, I should say, enjoy this practice.

00:26:18 Evaluating Light in Environment, Compensating for Missed Morning Light

It's really nice to get outside first thing in the morning and get this sunlight. In fact, when you start doing this, you'll notice that your body will start to feel more energized and it will feel more energized more quickly. You'll actually start to notice this mechanism kicking in each day, especially if you're paying attention to your physiology. So enjoy this practice of getting outside. Yes, you can take your morning beverage outside. Yes, you can take

your dog with you. In fact, animals intuitively know to get this morning sunlight. They actually seek it out at the right times of days. We human beings need to be told by podcasters and other people about the science that supports these kinds of practices. Our pets apparently do not. But get outside alone or with somebody, with your kids, with your dog. However you go about this practice, make sure you do this practice at least 80% of the days of your life. That's right. If you miss a day, for instance, you're bedridden for a day, try and get next to a window. Let's say you are traveling, or for whatever reason, you are not able to get outside first thing in the morning, well, then try to get twice as much sunlight in your eyes, or I should say extend the duration of sunlight viewing in the morning for twice as long the following day. This is a slow, integrative mechanism that underlies this whole thing of wakefulness during the day and sleep at night due to sunlight viewing and if you miss a day, you can make up for it the next day, but you have to get twice as much light or twice as much duration of light. If you really want to get technical and you really want to measure how much light is in your environment, you can download a free app, something like Light Meter, and that will allow your phone to act as a bit of a light meter. It'll give you a pretty accurate measurement of how many lux, which is a measure of brightness, are in your environment in the morning. And in general, that's just going to be a good tool for evaluating your environments. Here's what I suggest you do. Wake up in the morning, take Light Meter, point it at the brightest light in your home, and take a measurement, and what you'll probably find is it's about a thousand lux. Now go outside and if there's some sunlight out and there's cloud cover, point it at the sky and press that button. You can actually hold it down and it'll give you a dynamically updated lux measurement. And what you'll find is like 5,000, 10,000, sometimes even 90,000 lux, even though you don't experience it as so much brighter, and that's because an indoor artificial light is very concentrated over a small spatial area whereas the sunlight is very diffuse. But it's that diffuse, very bright sunlight, that photon energy, that you really want that's going to set all the rhythms of your brain and body in the proper way. Not just that cortisol peak, but it's going to trigger proper metabolism, it's going to set a timer for you to be able to fall asleep about 16 hours later, and on and on and on. And I should mention within the on and on and on, it's also going to suppress any melatonin, a hormone that makes you sleepy that happens to be swimming around in your bloodstream at the time you wake up. It does a number of other things too, including interact with the adenosine system and kind of wash out some of the adenosine that might still be residual if you didn't sleep

enough. Fundamentally speaking, get that morning sunlight viewing. I promise you will be grateful that you did. It makes everybody feel better, feel more alert,

00:29:26 AG1 (Athletic Greens)

and it will greatly assist with your ability to fall and stay asleep later that night. Before we continue with today's discussion, we're going to take a brief pause to acknowledge our sponsor, Athletic Greens, also called AG1. I started taking Athletic Greens way back in 2012. So I'm delighted that they've been a sponsor of this podcast. Athletic Greens contains vitamins, minerals, probiotics, digestive enzymes, and adaptogens. So it's got a lot of things in there. That's actually the reason I started taking it and the reason I still take it once or twice a day. It essentially covers all of my nutritional bases. And the probiotics in particular are important to me because of the critical importance of what's called the gut-brain axis, that is neurons and other cell types in the gut, in the digestive tract, that communicate with the brain and the brain back to the digestive tract in order to control things like mood, immune function, hormone function, and on and on. Whenever somebody has asked me what's the one supplement they should take, I always answer Athletic Greens. I gave that answer long before I ever had this podcast and it's the answer I still give now for all the reasons that I detailed just a moment ago. If you'd like to try Athletic Greens, you can go to athleticgreens.com/huberman to claim a special offer. They'll give you five free travel packs that make it really easy to mix up Athletic Greens while you're on the road, plus a year's supply of vitamin D3K2, which are also very important for a huge number of bodily factors and brain factors

00:30:46 Morning Tools: Temperature & Deliberate Cold Exposure, Exercise

that impact your immediate and long-term health. Again, that's athleticgreens.com/huberman to claim that special offer. Okay, so now we're still focusing on this early part of the day when you've woken up, the first hour or so after waking. And we can go to our list of other levers and tools, right? We have light and dark. We already talked about light and sunlight in particular. We've got temperature, food, exercise, caffeine, supplements, and digital tools. Now, once you've woken up and you want to be awake, okay? So this is likely to be early in the day if you're following a more standard schedule. You will also want to leverage not just light, but temperature as

a tool. If you are inclined, it would be wise to try and increase your core body temperature a bit more quickly than it would otherwise if you were to just, you know, shuffle around outside, get your sunlight, maybe read a little bit, et cetera, and there are two main ways you can do that. The first way is to get into cold water of some sort. So this could be a cold shower of anywhere from one to three minutes. This could be an ice bath if that's your thing. It could be a cold tub, or if you own a cold tub that's specifically designed for deliberate cold exposure. Get under some cold water. That will certainly wake you up. And if you've ever jumped into cold water or had a cold shower, you know it really wakes you up because you release adrenaline, epinephrine, from both your brain and body, the body from your adrenals and your brain from a little cluster of neurons called locus coeruleus. Again, the names don't matter. One to three minutes of cold water exposure will wake you up because of that adrenaline release and, and I want to highlight the and, it will serve to increase your core body temperature. That's right, your body and brain interact as a bit of a thermostat system where if you put something cold on the surface of your body, your brain, a little cluster of neurons in the so-called medial preoptic area, act as a thermostat and say, "Ah, the external of my body is cold and therefore I'm going to heat up my core body temperature." So it's a little bit paradoxical. People think, oh, if you get into cold water or an ice bath, your body temperature is going to drop. And indeed, that's true if you stay in for a while, but if you just get in for about one to three minutes, or under the cold shower for one to three minutes, your core body temperature will increase. So then when you get out of that cold water, your body temperature is increasing at a rate, at a slope, that's steeper than it would otherwise and you're going to feel more alert. It also has the advantage of increasing not just adrenaline, but dopamine, which is a molecule involved in motivation, focus, et cetera. So this is great for waking up. So we've got sunlight, we've got temperature triggered by cold water, and we have exercise. One of the best ways to increase your core body temperature early in the day is to do exercise. Now, some of you might choose to do your full-blown workout for the day first thing when you wake up in the morning, I would say the best time to exercise, at least what the research points to, is immediately when you wake up in the morning or three hours after waking or 11 hours after waking. But that's really getting down into optimization for sake of muscular strength and grip strength and it's very hard to give a strict prescriptive. Here's what I suggest. If you want to be alert early in the day and you want to sleep great at night, get that bright sunlight, get into some cold water, and if you don't want to get into some cold

water, try and get some movement. It could be a walk. So you can get your sunlight exposure while you're taking a walk first thing in the morning. It could be a light jog. It could be skipping rope. These days, I skip rope for about 10 minutes or 20 minutes while looking at the sun. So I'm trying to layer in these different things for waking up. And then I take a cold shower afterwards. This is what I've been doing as of lately, but I don't do that all year long necessarily. Or some of you are going to be working out mid-morning. I sometimes do that. But try and get your core body temperature increased first thing in the morning, and a great way to do that is with the cold water and/or with exercise. And again, it doesn't have to be your full-blown workout for the day if you're doing workouts consistently, which I hope everybody is because everybody really should exercise at least, I believe, five or six, or maybe even seven days a week. For me, it's six days a week, sometimes five, rarely is it seven. So get that exercise or even just a modest amount of movement, walking, jogging, skipping rope,

00:34:58 Timing Caffeine, "Afternoon Crash," Exercise

some light calisthenics. That will further increase your core body temperature and help you feel more awake. Then we have the category of caffeine. And again, we're just talking about this early part of the day, and you might be saying, "Wait a second, I thought this was an episode about tools for sleep." Well, everything that we're talking about doing in these first 60 to 90 minutes of the day really set in motion a wave of biological cascades that carry through the entire day and into the evening and into the night and really do serve to optimize sleep. So just hang in there with me. And for those of you that are interested in focus and attention, your ability to learn, all of these tools and practices are going to greatly enhance those as well. So the next category of tool for use early in the day is caffeine. Caffeine is a very important compound to think about. I do realize that some people who are prone to anxiety, especially panic attacks, anxiety attacks, might avoid caffeine entirely. That's absolutely fine. You do not have to drink caffeine. So what I'm about to describe are ways to leverage caffeine use to optimize sleep and wakefulness if you are comfortable with caffeine, if you like caffeine, I happen to love caffeine. I like it in the form of coffee or espresso or yerba mate tea, in particular non-smoked varieties of yerba mate tea. Non-smoked because the smoked varieties seem to carry some carcinogenics, some cancer causing risk. There's increasing data on that. So non-smoked varieties of yerba mate. So caffeine is something that a lot of

people consume early in the day. How much depends on your tolerance, and there's a lot of individual variability here. Again, caffeine is an adenosine antagonist, or effectively works as an adenosine antagonist and limits sleepiness. I highly recommend that everybody delay their caffeine intake for 90 to 120 minutes after waking. However painful it may be to eventually arrive at that 90 to 120 minutes after waking, you want, and I encourage you, to clear out whatever residual adenosine is circulating in your system in that first 90 to 120 minutes of the day. Get that sunlight exposure, get some movement to wake up, and then, and only then, start to ingest caffeine because what you'll do if you delay caffeine intake until 90 to 120 minutes after waking is you will avoid the so-called afternoon crash. And you may still get a little bit of dip in energy in the afternoon, but it's not going to be that massive crash. I've talked about the reasons for that crash on previous episodes. But if you delay your caffeine intake 90 to 120 minutes after waking, you are doing yourself a great service towards wakefulness and to avoid the crash. And the afternoon crash has another liability to it, which is typically people will emerge from that afternoon crash either grumpy or groggy and then they'll lean into drinking more caffeine, which can then disrupt their sleep. So wait 90 to 120 minutes after waking in the morning to drink caffeine. And if you drink caffeine at any point throughout the day, really try and avoid any caffeine, certainly avoid drinking more than a hundred milligrams of caffeine after 4:00 p.m. and probably even better to limit your last caffeine intake to 3:00 p.m. or even 2:00 p.m. And for many people, shifting that caffeine intake from immediately after waking in the morning to 90 to 120 minutes gives them a much longer arc of energy throughout the day and they don't feel the need to drink more caffeine later in the afternoon. If you do drink caffeine later in the afternoon, really try and limit the total amount or drink decaf. Certainly keep the total amount to less than a hundred milligrams if you are interested in getting into the best possible sleep. And I say this knowing that many people, including myself, can drink a double espresso with 200 milligrams of caffeine or more at 5:00 p.m. or even 6:00 p.m. or after dinner and still, quote, unquote, fall asleep fine or still sleep fine. However, there are terrific data, Matt Walker and I talked about this, and there are more and more papers all the time that point to the fact that caffeine intake late in the day, after 4:00 p.m. that is, can really disrupt the architecture of your sleep. So you might think you're sleeping well, but you're not sleeping nearly as well as you could if you avoided caffeine in those afternoon hours. Now, some of you might be doing your main about of exercise first thing in the morning and you want your caffeine before that about of exercise. In that case, I say, go for it.

Drink your caffeine, do your workout right after waking up. I don't have a problem with that. You will find, however, that you're going to get an early afternoon dip in energy and that dip in energy is going to be substantial because it's going to be a dip in energy that naturally follows that workout from the morning. So it's dependent on temperature, and it's going to be related to the elimination of that adenosine blockade by caffeine. So you're getting a kind of a one-two punch on your energy levels by taking a lot of caffeine and exercising early in the day. You can sort of expect that you're going to get a drop in energy in the early afternoon. That's okay if that works for you, but just know that delaying that caffeine 90 to 120 minutes after waking would be the ideal scenario most days and most scenarios. All that said, I absolutely respect the fact that people have different work schedules, kid schedules, et cetera. So if you want to do some or none or all these tools, that's really up to you.

00:40:08 Timing Eating, Alertness & Circadian Rhythm

I'm just providing them to you in the simplest form that I can possibly provide them. Now, the other lever or tool that you have available to you is food. Not just what you eat, but when you eat. And it turns out that if you eat early in the day, you support a biological clock mechanism that will make you more alert early in the day. That said, many people choose to fast in the early morning hours of the day or in the first part of the day. I'm one such person. I generally don't ingest any food until about 11:00 a.m. or 12 noon. Sometimes I'll have a protein shake. Sometimes I'll have some almonds. Sometimes I'll have breakfast. If people are meeting for brunch or breakfast, I will have breakfast for social reasons every once in a while. But most of the time I don't eat until about lunch time. However, some people are really hungry when they wake up in the morning. Just know that if you eat early in the day, you are further triggering an increase in metabolism and in temperature that will make you more alert. So you don't have to eat early in the day, but you can start to see how these different tools layer together. Sunlight viewing, exercise, cold water, eating. Many of them are converging on the same mechanisms. In fact, when you drink caffeine, there's also a small increase in body temperature due to the adrenaline increase that it stimulates. So all of these things can be layered on top of one another or you can use them individually or think about them individually. Now, food is an interesting lever or tool because it's not just about when you eat, but it's also about what you eat. And I've talked a lot about eating for energy and what that means in terms

of caloric energy versus neural energy, et cetera, in previous podcast episodes. We're not going to focus on that now because, frankly, to get into a description of whether or not somebody should eat fruits or vegetables or animal proteins or dairy, et cetera, early in the day, that's very nuanced. What you eat for your breakfast, or if you choose to not eat breakfast, is really up to you. All that said, if you eat a very large meal, it doesn't matter if you slept terrifically well 10 hours the night before or if you are about to go to sleep or if it's the middle of the afternoon, if your gut is full of food, there's just a large volume of food in your gut, it's going to divert a lot of blood and other critical resources away from other organs of your body, in particular, your brain, and you're going to be sleepy after eating a big meal. So this is sort of a duh, but I think oftentimes in the discussions about what to eat for energy, people neglect to consider food volume as a strong parameter or variable in that discussion. So if you eat a huge breakfast, it's likely that you are going to be tired immediately after eating that breakfast unless of course you exercise very hard prior to that and you metabolize all that food very quickly. So it's up to you whether or not to eat first thing in the morning or not. But if you do eat in the first few hours of the morning, just understand that you are setting or you are helping to set a food entrained, as it's called, circadian clock. Light, temperature, timing of food intake, movement and exercise, all of these things literally funnel in in a neural sense, they funnel into this thing that we call the circadian clock and they let that clock, that set of neurons, predict when you are likely to be eating and active and viewing sunlight the next day and the next day and the next day. I say all this because there are some beautiful studies, and I'll highlight one, again, in the show note captions, that show that if people are having a hard time waking up in the morning, one of the things they can do is maximize sunlight viewing, exercise in the morning, drink caffeine. Although, again, I support the idea that that would best be done about 90 to 120 minutes after waking. Eating some food in those early morning hours, et cetera, et cetera. You can layer in multiple levers or tools in order to be more alert. And that's what these levers and tools are really there for in this sense of what we're talking about today, which is optimizing sleep. Yes, they will make you more alert. Yes, they will provide some adrenaline and dopamine, for instance, the cold water, et cetera, et cetera. But the reason we're talking about these things in the context of sleep is that they start to give your body some predictable autonomic timing. What is predictable autonomic timing? Well, your autonomic nervous system is the components of your brain and body that cause wakefulness and sleepiness and you can start to create some predictability in that

autonomic timing. You can start to do things that really make it such that you naturally wake up at six in the morning or five in the morning. That's right, if you're somebody who naturally is a night owl, who likes to stay up until two in the morning and sleep until 10:00 a.m., and you now have a job or you have to go to school or you have a partner that likes to get up early and go to sleep early, well, you can make that happen and you can make that happen pretty painlessly if you take a week or so and go to sleep 30 minutes or an hour earlier each night, set an alarm and wake up 30 minutes or an hour earlier each morning until, of course, you're waking up at the time you want to wake up, and then even in that groggy state, get some exercise, get some sunlight viewing. If the sun's not out, turn on those bright artificial lights. Have some breakfast, even if you're not hungry. In fact, for those of you that engage in shift work because you have to, or travel and you're jet lagged, one of the quickest ways to shift your circadian clock

00:45:20 3 Daily Critical Periods

and get onto the local schedule is to eat on the local schedule. So what all these tools do is they really set up a cascade. Think of it as kind of a wavefront of wakefulness and focus throughout the day. It'll take you through the middle of the day and the afternoon stage we'll talk about in a few minutes, but really they take you to this period that is about 5:00 p.m. until your bedtime. I realize some people are going to bed very early, like 8:00 p.m. or 9:00 p.m., which to me seems very early, but very few people go to sleep at 5:00 p.m. right? Unless you're doing that for shift work or other reasons. But from 5:00 p.m. until bedtime is really a critical period in which you need to leverage particular tools in order to get and stay asleep optimally and to be able to sleep through the night. So really there are three critical periods throughout each 24-hour cycle. And during each of those critical periods, you're going to want to do as many specific things as you can to optimize your wakefulness and focus and mood throughout the day and your sleep at night. The first critical period is the one that we've been talking about up until now. Things like morning sunlight viewing, caffeine 90 to 120 minutes after waking, exercise, and so on. We can call that critical period one and it really encompasses the time from which you wake up until about three hours after waking. Although, I should just mention 'cause there are always those people that say, "Wait, I wake up at 4:00 a.m. and the sun isn't out until 8:00 a.m.," okay, so it might be four hours. But really it's those early morning hours of your day once you're awake. The second critical period

00:46:49 Afternoons: Naps, Deep Relaxation (NSDR, Self-Hypnosis), Exercise & Body Temperature, Caffeine

is the time throughout the day and afternoon leading into evening. So you may ask what are the things that you can do throughout the day, the middle of your day and into the afternoon and evening hours, that are really going to set you up for the best possible sleep later that night. Well, there are a few dos and there are a few don'ts. First of all, be careful about ingesting too much caffeine throughout the middle of the day. That's kind of an obvious one for the reasons that we talked about earlier. Second of all, if you are a napper, and I raise my hand now, for those of you listening, I'm raising my right hand because I love naps. I've always loved naps. Nowadays I do NSDR or a Reveri sleep hypnosis almost every day. And I tend to do that, as I mentioned, in the early afternoon hours if I'm feeling kind of sleepy, because even though I optimize my caffeine intake timing, et cetera, I tend to get a little sleepy in the afternoon. Most people get a little sleepy in the afternoon. Some of that is related to hitting that peak of body temperature. And you might think, wait, I thought high body temperature is associated with alertness, and it is, but right as you crest that high body temperature and your body temperature starts to drop, there's a tendency to be a little bit sleepy. So some of you might opt to take a nap in the afternoon. Should you nap, should you not nap? That's a question that I get asked a lot and that I asked Dr. Matthew Walker when he was a guest on this podcast. Here was his answer and here's what the data support. It is fine to nap in the afternoon, but don't nap so late in the day or for so long that it disrupts your ability to fall and stay asleep at night for your major sleep about, okay? So naps are fine, but don't sleep so long during the day or too late in the day that it disrupts your ability to fall and stay asleep. I should also say you do not have to nap. It's kind of an interesting phenomenon that happens on these podcasts and on social media where we'll talk about naps and the fact that naps are great, but don't make them longer than 90 minutes, but then all the non-nappers get really worried. Like, wait, am I supposed to nap? I don't like naps. I wake up groggy. You do not have to nap. In fact, if you can make it through your whole day without napping, great, more power to you. But if you do nap and you find that naps serve you well, keep those naps shorter than 90 minutes for reasons related to ultradian cycles and so forth, and make sure that you don't nap too late in the day that you are then staying up too late at night and having a hard time

waking up the next morning. I will say that for a lot of people who do not like naps or that find they wake up really grumpy from naps or groggy from naps, I encourage you to try the Reveri app, try an NSDR script, try yoga nidra. Try something of that sort for anywhere from 10 to 20 to 30 minutes. I tend to do this every day now. I'll just lie down, and I love yoga nidra, I love NSDR scripts, I love using the Reveri app. In particular, the portion of the Reveri app that gets you better at sleeping. It really is beneficial for me because it serves as very replenishing while I'm doing that hypnosis, but it's also gotten me much better at falling and staying asleep and falling back asleep in the middle of the night. So this critical period throughout the day is one in which most people are doing a lot of stuff. They're emailing and picking up kids and they're exercising and they're commuting and doing all sorts of things, taking phone calls and Zooms, et cetera. But if you can get that period of deep relaxation through a nap or NSDR, that's going to serve you well. Try not to drink too much caffeine, certainly no more than a hundred milligrams of caffeine, after 4:00 p.m if your goal is to fall asleep at a reasonably normal time. And for those of you that exercise in the afternoon, understand that if you exercise very intensely, so this might be weight training or running or some other very intense exercise, typically that's going to further increase your body temperature. Makes sense, right? Based on everything we know about metabolism and body temperature. And it's going to so-called delay your circadian clock. It's going to make it such that you want to fall asleep a little bit later, maybe even a lot later. So if you're exercising in the afternoon or evening and that's the only time you can exercise or that's the time that you prefer to exercise, great, but be careful about ingesting too much caffeine in order to get the energy to do that exercise 'cause that caffeine will disrupt your sleep and just know that you are delaying your circadian clock. You are making it such that you will naturally want to go to sleep later and wake up later. Contrast that with if you exercise early in the day, say, immediately after waking up or in the first zero to four hours after waking, in most cases, that's not going to shift your circadian clock much. And toward the end of the episode, we'll talk a little bit about forced exercise prior to wake-up times. That doesn't mean doing exercise in your sleep. That means deliberately setting an alarm and getting out of bed much earlier than you naturally would. That turns out to be a very potent tool to so-called advance your circadian clock. So we can talk about that a little bit later in the episode. But this critical period, too, in the middle of the day is when you're going to want to leverage specific tools, and we've talked about those: limiting caffeine intake; being mindful of the clock-delaying effects of exercise; the fact that, also, if you're going to nap,

you don't want to nap too long or too late into the day otherwise you'll disrupt your nighttime sleep. So this critical period two, or second critical period, I should say, during the middle of the day

00:51:59 Afternoon Tools: Viewing Sunlight in Late Afternoon, Evening Light

is a time in which you should be doing certain things and avoiding doing certain things. So that raises the question of whether or not you should also be getting a lot of light, in particular, sunlight, throughout the day. Now, that's something that hasn't been explored too much in the literature until recently when Dr. Samer Hattar who's the director of the chronobiology unit at the National Institutes of Mental Health, decided to do a number of experiments exploring the effects of light on mood and other aspects of brain function and body function when that light is delivered not just in the morning, which is great for us, but also throughout the day. So should you be looking at sunlight or bright artificial lights throughout the day? Now, on the face of it, you might just think, yes, you know, sunlight's great. Provided we're not getting a sunburn and we're not staring at the sun and damaging our eyes, we should get as much sunlight as we possibly can. In fact, we talked about this in the episode on hormones about how getting light onto as much of our skin as we can throughout the day can really help in the production of testosterone and estrogen in both men and women in healthy ways that improves mood and libido and all sorts of things that are associated with wellbeing. However, because light is such a powerful stimulus for controlling the timing of your sleepfulness, or sleepiness, I should say, and wakefulness, we might want to be cautious about how much light we are viewing in the afternoon, in particular, in the early evening hours, right? Well, turns out it's not so straightforward. Viewing, so sunlight to the eyes, sunlight in the late afternoon and evening hours, so again, depends on time of year, depends on location that you happen to be in, but getting some sunlight in your eyes for, again, maybe five or 10, maybe 30 minutes, depending on how much cloud cover there is, doing that in the afternoon serves an additional beneficial purpose, which is you protect or you inoculate your nervous system against some of the negative effects of bright artificial light or even dim artificial light in the nighttime hours between 10:00 p.m. and 4:00 a.m., which is really critical period three. And we'll talk about what to do and what to not do during critical period three of every 24-hour cycle. But to make it very clear what I'm saying here, get that morning sunlight in your eyes, but also get some sunlight in your eyes in

the late afternoon and evening hours when the sun is at so-called low solar angle, when it starts to descend in the sky. Again, you don't have to stare directly at the sun, although if you can catch a nice, beautiful sunset, go for it. But as the sun starts to descend, it triggers those same neurons in your eye that communicate with your circadian clock, but it communicates with a different component or different compartment within the circadian clock. That circadian clock is not just one thing. It's multiple things. And you have what are called morning oscillators and evening oscillators. And to make a long story short, the tool that I'm describing of looking at the sun in the late afternoon and evening, again, blinking is fine, don't stare at the sun, but getting that sunlight in your eyes in the late afternoon and evening signals to that clock that it's evening time and that sleep is coming. It also serves as a second anchor or reference point for your body and your brain to know where it is in time. Remember back to the beginning of the episode when I said your brain and your body and all your organs are locked inside this skin and this skull and they don't know what's going on in the outside world. Well, that morning sunlight viewing and the other things you do during critical period one, those provide one strong set of signals that it's wake-up time and time to be alert and time to be focused. And then in the evening, by getting sunlight in your eyes again, in particular, sunlight that comes from low solar angle sunlight, well, that provides a second stimulus or a second reference point that tells your brain and body, "Hey, it's evening. The sun is descending." Now, you might say, "Wait, how does the brain and these neurons know the difference between morning light and evening light?" It turns out has to do with the particular wavelengths of light that are present in morning versus evening. It's an incredible mechanism. And you are probably familiar with the fact that when the sun is directly overhead, it's really bright white and yellow and the sky's often blue, and if there's cloud cover, it just comes through as a bunch of bright light, well, next time you're out in the morning, take a look at what a sunrise looks like. There's a lot of yellow-blue contrast, and those yellow blues signal important specific sets of cells in your eye and brain that it's morning. In the evening, you're also going to see yellow and blue, but the ratio of yellows and blues has now changed and you also see some oranges, and in a really brilliant sunset, you'll see some reds. If you haven't noticed this already, you'll really want to look for this. It's really kind of fun and cool to look at. Well, those yellows and blues and oranges that you see in the evening sunsets, those signal to your brain and body that evening is there and that nighttime is coming and they're really establishing a second reference point or wavefront of biological signals

00:56:45 Evening/Night Tools: Overhead Artificial Lights, Light Sensitivity

that are going to optimize your nighttime hours and your transition into really terrific sleep. So now let's talk about what I'm calling critical period three of each 24-hour cycle. So this would be the period of time of late evening, So it might be 6:00 p.m. for some, depending on when you go to sleep, or 7:00 p.m. extending into the hours in which you decide to get into bed and go to sleep and then throughout the night. There are a number of things that you're going to want to do and there are a number of things that you are going to want to avoid doing in order to optimize your sleep. First of all, you're going to want to avoid bright artificial lights of any color. Yes, of any color. We haven't talked a lot about blue blockers, you know, lenses that block blue wavelengths or short wavelengths of light. I don't have anything against blue blockers. In fact, many people find that blue blockers provide them some relief from headache and some eye strain if they wear blue blockers throughout the day and certainly at night. But you don't need them, and even if you do wear them, you will find that if lights are very bright, doesn't matter if it's a blue light, a yellow light, or a red light, those bright lights will wake up your brain and body. They will activate the same mechanisms that were activated early in the day by sunlight. However, and here's the really diabolical twist, I mentioned this earlier, but the diabolical twist in the way that your brain and body respond to light is that early in the day, in the morning hours, you need a lot of bright light, ideally from sunlight, to be very alert and to wake up, but in the evening hours and nighttime hours, it takes very little light, very few photons, in order to wake up your brain and body and to disrupt your circadian clock and disrupt your sleep. So what that means is that once the sun goes down, which, of course, is going to happen at different times of year in different places on earth, but once the sun goes down, you would be wise to try and dim the lights in your indoor environment most days, right? I realize some nights you're going to throw a party and have people over. You might not want to dim the lights. Some nights you're going to go out, you might view a lot of bright lights. But most nights of your life, you're going to want to dim the lights in your internal environment. And ideally, the lights that you do use you would place low in that physical environment. So you would try and not use overhead lights, but rather rely on desk lamps or lights even placed low to the floor, even on the floor. If you are going to use light at night, and most people do, I would encourage you to use as little artificial light as is required to carry out the activities you

need to require safely. That could be studying, in which case you might need a little bit more light in order to read or study. If you're watching a television show or you're watching something on your computer, dim that screen way, way down, as dim as possible while still, of course, being able to view what you need to view. Even better, I should say, ideally, you would use candlelight and/or moonlight. Now, some nights the moon is really bright and you actually can use moonlight to go about your usual activities. Moonlight might seem very, very bright, but, actually, moonlight is fairly low light intensity, and candlelight, which can also seem very bright, actually is very low light intensity. If you're sitting across a table with some candlelight there and it's a really bright candle, chances are it's only about three to 10 lux, which is very, very little light energy compared to, say, an artificial desk lamp or an overhead light, which is going to be in the area of anywhere from a hundred to a thousand lux. So candlelight is fine. Of course, be cautious with open flame, but candlelight is fine. Moonlight is fine. Dimming artificial lights is fine provided they're dimmed way, way down. And again, try and avoid using overhead artificial lights. The absolute worst lights are going to be overhead fluorescent lights of the sort that you would have in the supermarket or that you would see at a gas station or something of that sort. And I confess, there are times in which I'm driving home and it's late at night and I want to be able to get to sleep and I'll need to stop at the grocery store or a gas station or something like that, I've actually put on sunglasses at night in order to avoid getting that bright light exposure at night. Although that's a little bit extreme, I have done that from time to time because that bright light exposure will absolutely quash, it will eliminate, any melatonin that happens to be circulating in your brain and body. Now, melatonin, a lot of people think of it as a supplement, but melatonin is naturally released as the evening comes about and into the nighttime hours. It's the hormone that makes you feel sleepy and allows you to fall asleep. So viewing bright light in the late evening hours and nighttime hours is really not good for your sleep quality and your ability to fall and stay asleep. So for most people, a simple rule of thumb is going to be avoid bright artificial lights of all colors, and in particular, overhead bright artificial lights, between the hours of 10:00 p.m. and 4:00 a.m. That's right, between 10:00 p.m. and 4:00 a.m., avoid those bright artificial lights as much as possible. Use only as much light as is absolutely necessary in order to carry out the routines and activities you need to carry out safely. I should mention that the reason overhead lights are problematic is the same reason why sunlight is so great early in the day, which is that the cells, that is, the neurons, that can wake up your brain and body through

activation of the circadian clock reside mainly in the bottom half or 2/3 of your neural retina and the way the optics of your eyes work is that the cells on the bottom half of your eye view the upper visual field. So this is a beautiful adaptive mechanism that allows these cells to respond to overhead light from sunlight in the early part of the day and throughout the day. But in the evening, if you have bright artificial lights on and those bright artificial lights are overhead lights, it's going to more closely mimic what sunlight does in the evening time, and that turns out to be a bad thing if your goal is to eventually go to sleep. So again, do like the Scandinavians do. Use lights that are set low in the room at night, and if you really want to optimize your sleep-wake cycles, I suppose you could also do the opposite throughout the day. You could really emphasize the use of bright artificial lights and sunlight that comes from above. And of course, sunlight always comes from above. But if you're working in a given office environment and, you know, it's 2:00 p.m. or 3:00 p.m. and you want to be as awake as possible, really crank up the overhead lights. And then in the evening, which is this critical period three that we're referring to, really try and dim those lights or have them off or just rely on candlelight or moonlight from the hours of about 10:00 p.m. until 4:00 a.m. Our good friend Samer Hattar, who's been on this podcast before, Samer is director of the chronobiology unit at the National Institutes of Mental Health, well, he's absolutely obsessive about this light stuff and avoiding light at night. In fact, he lives in what I sort of joke is like a cave at night. From 9:00 p.m. until 5:00 a.m., which is really his kind of sleep cycle, he has his house so dark that you'd be lucky to be able to find a spoon in the kitchen. In fact, you'd be lucky to find your way down the hallway if you're me. But in any case, dim the lights. Turn them way, way down. It will serve you well. It will make it much easier for you to get sleepy and stay sleepy and fall asleep and stay asleep throughout the night. Now, not to depart from this critical period three, but if you recall, viewing that afternoon light, the low solar angle light as the sun is heading down in the sky, so it could be sunset or what I call circa sunset, around sunset, well, doing that is going to slightly, but not completely, offset any of the negative effects of viewing artificial light at night. So I don't want to give people a pass here, but let's say you know that you're going to watch some Netflix at night or you're going to be up late studying and yet you still want to be able to fall and stay asleep. Definitely make sure you see that evening light. There's a great study. We'll provide a link to this study, which showed that if people view evening sunset light or evening sunsets or sunlight right around the time of sunset, it really serves to inoculate or offset some, again, some, not all, of the

negative effects of artificial light between the hours of 10:00 p.m. and 4:00 a.m.

01:04:40 Evening Tools: Hot Bath/Sauna, Temperature & Sleeping Environment

Now, that's light. But as you recall, we also have this tool related to temperature, and you're probably not going to be surprised that the way to leverage temperature in the evening is the exact opposite of the way that you want to leverage temperature early in the day. Early in the day, temperature increases from cold showers or exercise, et cetera, wake you up. What that means is that taking a cold shower late at night is probably a bad idea. Rather, taking a nice hot bath or a sauna, you might think would heat up your body, and indeed, that's what happens if you stay in a very long time, but if you do hot tub or a hot bath or a sauna in the evening, and you don't stay in for more than 20 or 30 minutes and you get out, you take maybe a cool-ish shower or a warm shower, then what happens is there's a compensatory cooling off of your core body temperature for the reasons we discussed earlier, and your body temperature will drop by one to three degrees and it will make it much easier to get into sleep. So if you're somebody that enjoys hot baths, hot showers, or hot tubs, evening and nighttime is going to be the best time to do that if your goal is to facilitate sleep. Similarly, you should try and make your sleeping environment pretty cool, if not cold. Now, that doesn't mean you need to be cold while you're asleep. You can get under as many blankets as you need, but it's a good idea to make your sleeping environment cool. In fact, drop the temperature in that sleeping environment by at least three degrees and you'll be happy that you did. Now, some people rely on things like Eight Sleep. I use that. One of these controllable temperature mattress covers. Other people would simply do this by putting a fan in the room or opening a window. Again, depends on time of year, depends on technology, depends on budgets, et cetera. But you're going to want to sleep in a relatively cool or cold sleeping environment and then layer on the blankets as needed to stay asleep. And I say as needed because one of the things that you're going to do in your sleep, or if you happen to wake up, is if you're too warm, you're going to put a foot or a hand out from under those blankets. And the reason for doing that is very logical once you understand the mechanism. You have special portals, you essentially have ways of passing heat, excuse me, in and out of your body primarily through the palms of your hands, the upper half of your face, and the bottoms of your feet through so-called glabrous skin. This was covered in the episode with Dr. Craig Heller from the biology

department at Stanford. If you lower the temperature in your sleeping environment, so lower the temperature in that room or use a controllable mattress cover that can cool down like Eight Sleep or something of that sort, it's naturally going to make your sleep environment cooler, and if you're too warm under the blankets, all you have to do is extend a hand or a foot out from under those blankets. Whereas if the sleeping environment that you're in is too warm, there's very little you can do to cool off besides push off those blankets. So for instance, if you're too warm and you're waking up in the middle of the night, which is what happens if you get too warm, you'll push off those blankets. But if the room is too warm, well, what are you going to do? You'd probably have to put your hands into some cool water or take a coolish shower or something for a couple of seconds. That's not very practical. Better to just keep the sleeping environment cool. I'm not a big fan of people putting socks on while they sleep, or I should say, I'm not a fan of putting socks on while I sleep, because that eliminates this glabrous skin portal on the bottoms of one's feet. So for those of you that have heard, you know, wear socks while you sleep, that works great for people that tend to run too cold while they sleep and wake up because their feet get cold, but if you're somebody who wakes up in the middle of the night, chances are you're waking up because you're getting too warm and the best thing that you could do is to cool or lower the temperature in the room that you're sleeping and not wear socks, get under as many blankets as you need to fall asleep, and then across the night, you'll naturally just move a hand or a foot or all hands and feet out from under those blankets to cool off because of the relationship between temperature and sleep. That is, dropping your core body temperature one to three degrees gets you into sleep and helps you stay asleep. So let's say you do exercise late in the day and you're finding yourself very alert in the evening and you need to fall asleep, or let's say you've exercised and you needed four cups of espresso in order to do that exercise. Well, there are a few things that you can do to try and bring your nervous system down into more state of calmness, and you can do that also by lowering your core body temperature. One of those I already talked about before, taking a nice hot shower or a hot bath and then getting out and cooling off will decrease your body temperature. Maybe not enough to get you into sleep if you have a ton of caffeine in your system. But again, you can use this mechanism of temperature shifts to wake up or temperature shifts to fall asleep in ways that really can help you overcome some of the irregularities in your sleep-wake cycle and exercise cycle, et cetera. Because, of course, nobody's perfect. Some days we end up having to workout in the afternoon or we'll miss

the workout entirely. Other days, we end up having that cup of coffee in the afternoon with a friend and then we have a hard time falling asleep. So you can use these tools not just in their optimized form, you know, being absolutely obsessive and compulsive about exactly when you do each of those tools. That would be wonderful, but life happens as they say and some days you're going to feel too alert at night and you want to fall asleep, or you've got to get up especially early the next morning and you're not somebody who normally goes to bed at 10:00 p.m. Well, that's when a something like a hot bath or a sauna

01:09:40 Alcohol, THC & Reduced Sleep Quality; CBD, Anxiety & Falling Asleep

can really benefit you because it can adjust your temperature rhythm accordingly. I would be remiss if I didn't touch on alcohol and CBD and THC. I always get questions about these. And I should say, of course, many places, but not all, THC is illegal. Although, there are medical uses and in some places, it's decriminalized, other places it's legal. Alcohol, of course, is consumed almost as frequently as caffeine is consumed. I personally don't drink alcohol. I don't have anything against it per se. I just don't tend to enjoy it. One of the reasons I don't enjoy it is if I drink alcohol, I simply fall asleep. So that doesn't really accomplish any of the things that I really want to accomplish because the sleep that one gets after drinking alcohol is greatly disrupted sleep. Hate to break it to you, but that's the truth. And when Dr. Matt Walker came on this podcast, he said exactly the same thing. While THC and alcohol do help some people fall asleep and maybe even stay asleep, the architecture of that sleep is suboptimal compared to the sleep they would get without alcohol or THC in their system. So I'm not here to tell you what to do or not to do. I'm certainly not the substance police. That's not my role. I'm just reporting to you the biology. If your sleep is not restoring you to the extent that you feel it should, or if you are regularly relying on a drink or two in order to fall asleep, or THC in order to fall asleep, that is disrupting your total pattern of sleep. However, I do realize that nowadays a lot of people are relying on THC and/or CBD, especially edible forms, in order to fall and stay asleep. And, you know, we can just acknowledge the data. It does seem that there's an anxiety lowering effect of some of those compounds that do help people who have a hard time falling and staying asleep because of reasons related to anxiety. Although, in a moment, we'll talk about some supplements and supplement protocols that can also assist in the ability to fall and stay asleep and that can adjust

anxiety and that do not seem to disrupt sleep architecture in negative ways

01:11:45 Sleep Supplements: Magnesium Threonate, Apigenin & Theanine

and, in fact, can enhance the depth and quality of sleep architecture. Okay, so you've done everything correctly up until now. You got your morning routine from critical period one. You've got your afternoon routine. You saw some sunlight in the afternoon. You avoided caffeine in the eight hours or 10 hours before bedtime. You're not drinking alcohol. You've cooled down the room. You're doing all these things right. You've dimmed the lights, et cetera, et cetera. What else can we do in order to optimize our sleep? Well, I always say behavioral tools first, then look to nutrition, then, if necessary, look to supplementation, and then, if still necessary, look to prescription drugs obviously prescribed by a board certified physician. Well, we've talked a lot about the behavioral tools for critical period three. We have not talked a lot about the supplementation-based tools. There are supplements that for most people will greatly improve their ability to fall and stay asleep and the three main supplements in that category or that kit of sleep supplements, and I've talked about these before, are magnesium threonate, so T-H-R-E-O-N-A-T-E, apigenin, A-P-I-G-E-N-I-N, apigenin, and theanine, T-H-E-A-N-I-N-E, theanine. Now, some important things to point out about mag threonate, as it's called, apigenin, and theanine. First of all, you don't necessarily need to take all three, although, many people get a synergistic effect from taking all three. In fact, you may not even need to take even one. What I recommend is that if you're already doing all the behavioral tools regularly and you're still having trouble falling asleep and staying asleep, well, then you might try one of the supplements within this sleep stack. They do have fairly wide margins for safety. Although, I should also say, anytime you're going to add or remove something from your supplement protocol or your nutritional program, you definitely want to talk to your physician. I don't just say that to protect us. I say that to protect you. But for most people, the margins of safety on these things are going to be pretty broad. A couple of notes about dosages. For some people, the dosages of any one or several of the supplements I mentioned will be zero. That is, you won't need them in order to get and stay asleep most nights of your life. That's terrific if you don't need them. For many people, however, taking 145 milligrams of magnesium threonate can be very beneficial. That's the dosage that most people will benefit from. Some people need to go a little higher. Some people need to go a little bit lower. One of the reasons that we've been

pointing people towards single-ingredient formulations these days is because it allows people to adjust the dosage of one component of a so-called sleep stack without having to disrupt the dosage of another component, and so on. It also allows people to try just one element within the sleep stack without having to purchase and try the others, which is a problem if you're buying a blend of a lot of different ingredients. So 145 milligrams of magnesium threonate. 50, 5-0, milligrams of apigenin. And again, you could just take the apigenin on its own. And 100 to 400 milligrams of theanine taken, again, alone or in combination with the other supplements mentioned in the stack many people find allows them to get really drowsy and fall asleep, sleep really deeply, and they feel much more refreshed the next day and they don't have a grogginess to them. Now, a couple of notes about these different supplements. About 5% of people report that magnesium threonate really disrupts their gut. It gives them diarrhea or gastric distress. In which case, don't take it. If magnesium threonate disrupts your gut or your digestion to a point where it's uncomfortable or at all and you don't like it, don't take any of it. The proper dosage for you, in other words, would be zero milligrams. Now, in a slightly different way, many people who can tolerate magnesium threonate or really thrive on magnesium threonate and like apigenin might find that theanine, even at the lowest dose of a hundred milligrams, 'cause, again, the range is a hundred to 400 milligrams, that theanine gives them such vivid dreams that they actually find it disruptive where they wake up in the middle of the night or they find that the sleep that they're getting is kind of anxiety ridden because of the intensity of those dreams. So some people might choose to leave theanine out of the sleep stack and just take magnesium threonate or apigenin. And again, some people might leave magnesium threonate out of the sleep stack. Again, all of this is really about finding the supplementation protocol that's ideal for you. I should mention that whether or not you're taking one or two or three of the components of the sleep stack, the ideal time to take those is 30 to 60 minutes before bedtime, especially if you haven't had anything to eat for the three hours or so before bedtime. I confess that oftentimes I'll have a little bit of a snack late in the evening, some berries or something. I try not to eat too close to bedtime, but some evenings just because of work schedule, I'll get home late, be 9:00 p.m.,

01:16:34 Melatonin Supplementation (Caution)

and I'll eat a big meal and then I'll take the sleep stack and fall asleep. Every once in a

while, that just so happens. Nobody's perfect. Certainly I'm not. But that sleep stack can be very beneficial. And I do think that it's preferable to melatonin. Here's the reason. First of all, melatonin is a hormone that you endogenously make. You now know a lot about melatonin and it's controlled by light, meaning light inhibits it or eliminates it, darkness promotes it. And melatonin indeed can help us fall asleep, but the dosages of melatonin that are contained in most commercial products is far, far, far greater than what we would make endogenously. So it's really supraphysiological. So that's of concern because melatonin is not just responsible for making us sleepy and fall asleep. It also does things like interacts with other hormone systems, testosterone and estrogen, even in the puberty system, in kids. Is taking melatonin every once in a while a problem for adjusting to jet lag, et cetera? Probably not. I would even say no. But taking it chronically over time, especially kids taking it chronically over time, can potentially be problematic. So at least in my opinion, these other supplements

01:17:44 Additional Sleep Supplements: GABA, Glycine, Myo-Inositol & Anxiety

are going to be preferable to melatonin. Now, as I mentioned in the beginning of today's episode, there are some other things that I certainly take every once in a while and that other people might consider taking in addition to the sleep stack I talked about before or in place of that sleep stack if that sleep stack doesn't work well for them. So every third or fourth night, I will take two grams of glycine and a hundred milligrams of GABA in addition to the standard sleep stack that I talked about before. So I'm taking mag threonate, apigenin, and theanine, and then I will also take two grams of glycine and GABA, which I find greatly enhances my ability to get into sleep. But the reason I only add glycine and GABA every third or fourth night is that if I take it too often, I find that the entire sleep stack doesn't work quite as effectively. I don't know exactly why this is the case, but in any event, that's what I do. And more recently, I've also started using inositol, in particular myo-inositol. Every other night, I'll take 900 milligrams of myo-inositol in addition to mag threonate, apigenin, and theanine, and not on the nights when I take glycine and GABA. So I'm adding 900 milligrams of inositol to the standard sleep stack of mag threonate, theanine, and apigenin. And what I find is not only does it greatly enhance my ability to fall asleep quickly, but if I wake up in the middle of the night, which I often do to use the bathroom, I find it very, very easy to fall back asleep. Whereas when I don't take inositol every other night or so, I find that if I wake up in the

middle of the night, it's a bit more of a challenge to fall back asleep. So inositol has a number of different uses that have been discussed in terms of mental health and in terms of adjusting anxiety for its daytime use. What I'm talking about is taking 900 milligrams of myo-inositol also 30 to 60 minutes before sleep along with the standard sleep stack and I found that to be immensely beneficial. I also noticed that it has a pretty long tail of anxiety suppression throughout the day. And I'm not somebody who suffers from anxiety, but I have to say it just has led me to feel a bit calmer throughout the day, and I don't really know how to say this except in subjective terms, to feel a bit more buffered against or resilient against stress events. And if you look at the literature on inositol and its interactions with the serotonin system and other systems, that all makes sense as to why that would be the case. So we'll provide links to our so-called sleep kit, which is part of our Neural Network Newsletter. It's a zero-cost newsletter

01:20:08 Falling Back Asleep: Reveri App, NSDR, Yoga Nidra

where you can access this information about supplements and other behavioral tools for sleep in list form. But that sleep kit doesn't include some of the newer information that I've provided this episode, in particular, the information about inositol and what I'm finding to be the very beneficial use of inositol for the ability to fall back asleep after waking up in the middle of the night, which is something that a lot of people struggle with. Now, that's supplementation for falling and staying asleep, but we can return to the behavioral tools also as powerful levers and tools for falling asleep and getting back to sleep. And again, we look to NSDR, non-sleep deep rest, or the Reveri app as a way to do that. As I mentioned earlier, the Reveri app has been developed on the basis of really high-quality, peer-reviewed research, both clinical and non-clinical, by my colleague, David Spiegel, who's our associate chair of psychiatry at Stanford. It's a wonderful tool. It does carry a cost after the initial seven-day trial. I can tell you what the cost on that is so you can get a sense because I do realize that anything that carries a cost, for some people, it won't be accessible. Right now, Reveri, and I should just mention, they didn't pay us for an ad read. I'm just telling you what they told me so that I can accurately report what it costs to use Reveri. They have a monthly subscription to use the Reveri app at 14.99. You do get the seven-day free trial. They have a yearly subscription of 99.99 with a seven-day free trial. And they have a lifetime purchase, one-time purchase, of 249 with no trial. It right now is only available for Apple, not for Android, but they are,

yes, going to have it available for Android soon. There's a signup list there. I should mention that while the cost might seem high, if you compare that cost to, say, supplements, or you compare that cost to a poor night's sleep over time, the cost, at least to me, seems somewhat modest, certainly within range for a number of people. But I acknowledge not within range for other people, which is why I also want to point to zero-cost tools and the zero-cost tool for getting asleep, staying asleep, and falling back asleep is going to be NSDR. We'll put a link to a non-sleep deep rest protocol that's available on YouTube, so available to anybody zero cost provided you have an internet connection. Again, dim the screen if you're going to turn that on late at night. And there are a number of other yoga nidra scripts and apps and sources around the internet, in particular, on YouTube, that are zero cost that you could use if the Reveri app is outside your price range or is not preferable to you, et cetera. When I wake up in the middle of the night, it's usually to use the restroom. I'll go use the restroom. I'll keep the lights as dim as possible. I'll get back into bed. And if I find that it's easy to fall asleep, great, I'm asleep. And if not, then I will generally plug in the Reveri app. They have a fall back asleep hypnosis, and 99 times out of a hundred,

01:22:55 Staying Asleep: Eye Masks, Ear Plugs, Elevating Feet

I'm back asleep within minutes and I don't wake up until morning. Now, very briefly, I just want to touch on some tools that are very commonly used by many people out there, and believe it or not, there is peer-reviewed science on things like eye masks. Do eye masks improve your ability to stay asleep? And indeed, they do, provided they are not too tight and provided that the room is cool enough. Why? Well, eye masks cover the upper half of your face, which is where glabrous skin is localized. Remember, palms of the hands, bottoms of the feet, glabrous skin on the face. So a lot of people who wear eye masks will wake up because they're too warm if the room is too warm. So if you're going to use an eye mask to keep light out, definitely make sure the room and your sleeping environment and your bed are cool enough in order for you to stay asleep. In addition, I get a lot of questions about earplugs. Here's the deal with earplugs. Some people find that earplugs are very beneficial because, of course, they prevent the entrance of sound into the ear that could wake us up. But some people find that the sound of their own beating of their own heart can be disruptive and they get a sort of humming in their head when they have those earplugs in. I'm one such person.

Although, I have family members that like using earplugs when they sleep. So it's really up to you. You have to see whether or not those earplugs help or disrupt your sleep. For me, they're no good. For some people, they really enjoy them. I don't use an eye mask unless I'm sleeping in a really bright environment or I need to sleep on a plane and things of that sort. Other tools that I'll just mention that have peer-reviewed research to support them. Elevating your feet either with a pillow or by elevating the end of your bed by about three to five degrees can be really beneficial for increasing the depth of sleep because of the so-called glymphatic washout. This is the movement of and circulation of fluids in your brain at night that lead to more wakefulness and actually can improve cognitive function and a number of other things related to brain health. There's one caveat to that. For people that suffer from acid reflux, having your ankles elevated above your chest or above your heart in the middle of the night can actually exacerbate that acid reflux. You want to do the opposite. You want to actually elevate the head side of your bed

01:24:58 Tool: Sleep Apnea & Nasal Breathing

by about three to five degrees. Now, one of the common causes of sleep disruption that has tremendously detrimental effects is so-called sleep apnea. So this is basically bouts of suffocation or lack of oxygenation during sleep. This is particularly the case for people that are very heavyset, and that heavyset could be from obesity, it could also be heavyset from having too much muscle. A lot of people who are carrying too much muscle will actually have sleep apnea without realizing it. Sleep apnea is actually very dangerous. It's associated with a number of cardiovascular issues. It's associated with sexual dysfunction. It's associated with issues with cognition. Sleep apnea is bad. A lot of people will have to use the PAP, which is a, it's a device. It looks like a sort of like a snorkel mask or a dive mask. It's a whole apparatus that people will go to sleep with. However, many people can relieve themselves of sleep apnea provided it's not too serious and can sleep much better, in fact, I think all people can sleep much better, if they train themselves to be nose breathers while they sleep. There are a lot of reasons to be a nose breather unless you are breathing very hard due to exercise or talking or eating. That was all covered in James Nestor's book, "Breath: The New Science of a Lost Art." It's been covered in a number of different podcasts. We've talked about it on this podcast as well. It's a good idea to be a nose breather unless you need to mouth

breathe. And it's a great idea, it's a superb idea, to be a nose breather in sleep. And one way to really get good at that is to take a little bit of medical tape and to tape your mouth shut before going to sleep. You heard me right. Put some medical tape over your mouth and force yourself to nose breathe during sleep. It also prevents snoring in most cases. Really offsets sleep apnea. Sleep apnea, again, being a very serious health concern. I should also mention as a tool that if you have a hard time being a nose breather in sleep, you can try doing your cardiovascular exercise, at least the lower-intensity cardiovascular exercise, through purely nasal breathing. And one way to do that, again, is to tape your mouth shut or put a gulp of water in your mouth, but don't actually swallow that mouth full of water, or to use a mouthpiece or just deliberately keep your mouth closed and insist on breathing through your nose. Most people find that when they start doing cardiovascular exercise that way, it's really challenging at first, but over time, they actually can feel quite calm and still can generate a lot of physical effort purely using nose breathing. The reason that doing nose breathing during cardiovascular exercise translates to being a nose breather during sleep is that your sinuses actually can dilate, they're plastic, and over time, plastic meaning they're malleable that is, and they can become wider. You're not going to get giant nostrils. Don't worry about it. Your airways within your skull, 'cause that's what the sinuses really are, these little passages within the skull, and, of course, within the nasal passages, will dilate and will allow you to breathe more easily through your nose. But for those of you that are waking up in the middle of the night breathing on your back [breathing heavily] or your partner is telling you that or other people are telling you that or you're that person on the plane with your mouth hanging open and drooling and your mouth breathing, terrible, terrible, terrible for health reasons and other reasons, put some a medical tape over your mouth, learn to be a nose breather during sleep. Your sleep will improve and your daytime feelings of wakefulness and focus will improve, your cardiovascular health will improve, and on and on and on. So now we've largely covered the tools that one could use to get and stay asleep, and we talked about exercise, we talked about temperature, we talked about supplements, and we talked about, of course,

01:28:20 Sleep Schedule Consistency, Weekends, Compensatory Sleep & Caffeine

keeping the sleeping environment both cool and as dark as possible. I do want to mention a couple of broad contour tools that will impact your ability to sleep really well

on a consistent basis and the one that impacts the most number of people is weekends. Turns out that most everybody feels the impulse to sleep in on the weekend, especially if they've been out late the night before. However, the data show that keeping relatively consistent sleep and wake times is really going to enhance the quality and depth of your sleep. So if you stay out late one night, sure, you might allow yourself to sleep in an extra hour or so, but you should really try to avoid sleeping in longer than an hour beyond your normal wake-up time. That's right. If you normally get eight hours of sleep and you wake up at 7:00 a.m., probably okay to wake up at 8:00 a.m. on the weekend or after a night out the night before, but try not to sleep until 11 or noon thinking that you're going to catch up on your sleep or that's better than waking up at a consistent time. It would be better to wake up at a consistent time plus or minus an hour and get a nap in the afternoon provided that nap, again, isn't too long. And the other tool that relates to nights that you stayed out too late or that you feel like you want to sleep in a bit more in the morning is if you are going to wake up at your consistent time. So for example, normally you go to bed at 10 and you wake up at six. Let's say that's your schedule. And you end up staying up late one night until midnight or one for whatever reason and the next morning you wake up at seven and you're still groggy. In that case, you absolutely want to wait to ingest caffeine 90 to 120 minutes after waking. You really do because there are good data to support the fact that caffeine can disrupt sleep. Yes, that's obvious. Caffeine especially disrupts sleep if you take it too late in the day. That's very obvious as to why that would be the case. But caffeine especially disrupts what's called compensatory sleep. So if you start changing your waking time and your to sleep time and you start using additional caffeine to offset the sleepiness that you're experiencing because of those late nights out, well, that's when you really start to disrupt not just your nighttime sleep, but your daytime compensatory sleep, so those naps. You also are disrupting the total architecture of sleep in the early morning hours. There's a lot of great science that's been put to this, or that's emerged from this, I should say. So try and keep those sleep-wake times relatively constant plus or minus an hour, and try as much as you can to delay that caffeine intake 90 to 120 minutes after waking every day, but especially on days where you wake up and you feel you haven't gotten enough sleep. In that case, I highly recommend you just use NSDR or the Reveri app or some other form of deep relaxation to try and compensate for the lack of sleep, knowing, of course, that there's no complete compensation for lack of sleep.

01:31:14 Tools: Temperature Minimum & Jet Lag, Shift Work & Red Lights

There are just things that we can do to partially offset lack of sleep. Now, a couple of final points and additional tools that I think are going to be useful to everybody, in particular, people who have young children or are following a shift work schedule or who are experiencing jet lag. Keep in mind, jet lag can be due to travel, which is obvious, but jet lag can also be due to getting woken up in the middle of the night, right? Your body doesn't know the difference between flying to a new time zone and getting woken up in the middle of the night. The tool that I'd like to offer you is an understanding of something called temperature minimum. And I'm going to make this as simple as possible and I'm confident that everyone can understand this even if you don't have any science background. Here's the question you need to ask yourself. What is your typical wake-up time, okay? What's your typical wake-up time? If for you, your typical wake-up time is 7:00 a.m. plus or minus half an hour, and that could be 7:00 a.m. because you set an alarm clock or it could be 7:00 a.m. because you naturally wake up at 7:00 a.m., doesn't matter, if your typical wake-up time most days is 7:00 a.m., well, then your temperature minimum is 5:00 a.m. That's right, your temperature minimum is not a temperature. It's a time within your 24-hour cycle. Approximately two hours before your typical wake-up time, your body is at its lowest temperature that it will ever be in the 24-hour cycle. That's why it's called your temperature minimum. Here's what you need to know about your temperature minimum. If you view bright light, exercise, or drink caffeine or all of the above in the two to four hours before your temperature minimum, that will delay your clock. What that means when I say delay your clock is it will make you want to go to sleep later and wake up later the next night, okay? So let's run this exercise for you, the person waking up at 7:00 a.m. on a regular basis, I can predict with almost certainty that your body is going to be at its lowest temperature at 5:00 a.m.. So what that means is that if you get up at 3:00 a.m. or at 4:00 a.m. and you flip on bright lights in your house or in your bathroom or you have a cup of coffee or you do any kind of exercise or you get up and head to the airport, the mechanisms in your brain and body that control timing of sleep and timing of waking will shift. They will delay. It's as if you put your clock on hold for a little while and then let it start again, okay? That's the simplest way I can describe it. And you will tend to want to go to sleep later and wake up later the following night. Now, the opposite is true if you view bright light, drink caffeine, or exercise or socialize, I should say, in the hours immediately after your temperature

minimum. So for you in this example, the person who's waking up at 7:00 a.m., your temperature minimum is 5:00 a.m., if you view bright light, exercise, maybe have a snack, maybe not, or socialize, move about, at 5:30 or 6:00 a.m. or 7:00 a.m. That will tend to phase advance your clock. It will tend to basically make you want to go to bed earlier and wake up earlier the following night. Now, I used this example of a person who wakes up typically at 7:00 a.m. whose temperature minimum is 5:00 a.m., but, of course, you need to adjust that for yourself if you're somebody who wakes up at 9:00 a.m. or at 5:00 a.m. et cetera. Why do I offer this as a tool? Well, this is an immensely powerful tool if, for instance, you are headed to a time zone where you need to go to bed earlier and wake up earlier once you arrive in that time zone. What it means is in the day or two before you leave, you can force yourself to exercise, drink caffeine, maybe even to eat a meal early in the morning, or maybe you still fast early in the morning and that's really up to you, but you force yourself to do the activities that are going to phase advance your clock. Whereas if you're traveling to a time zone where you are going to need to go to sleep much later and you're going to need to wake up much later or even a little bit later, you can do those things in the hours prior to your temperature minimum. Now, for those of you that work shift work, this can be especially useful, but I want to say a couple of things about shift work. There are a lot of details about shift work and jet lag in an episode that I did specifically about jet lag and shift work. So for the deep dive, go there, but suffice to say this for now, if you are going to do shift work, try to stay on the same shift for two weeks at a time. It's very detrimental to brain and body, it can even be horrifically challenging for your brain and body in a number of ways, if you are switching on the so-called swing shift, you know, you're working three days the night shift, three days the day shift, three days the night shift, three days the... Try and stay on the same schedule as much as possible. And I should say for everybody, people who are jet lagged and engaged in shift work or not, but just for everybody, if you need to be awake in the middle of your sleep cycle and it's not just a quick departure to the bathroom and back to bed, but you really need to be awake, you know, you're feeding a baby or you're taking care of a loved one or you need to do something that's critical or you need to work, if possible, use red light, okay? Now, for shift workers who really are trying to stay awake all night and sleep all day, this is not going to be ideal, but for people that, for instance, need to stay up really late one night or wake up especially early, like 3:00 a.m., to prepare for an exam that you're just not ready for or to head to the airport, et cetera, using red light has been shown to allow people to be awake enough and obviously see

what they need to see in order to perform their activities safely but it does not seem to disrupt the cortisol rhythm that is the healthy, normal cortisol rhythm. Now, I realize this is kind of an advanced tool and many people won't have access to this. There are a number of different sources for red lights now. Companies like Joovv or KOZE light. These are different brands. I don't have any affiliation to any of these brands, I should say. There are a number of different red light bulb sources out there and commercial sources that you can explore if you want. But understanding this temperature minimum is really powerful because it allows you to adjust your schedule depending on travel, depending on changing work schedules or school schedules. And if you're not a morning person, you can use the tools related to temperature minimum to really become a morning person over time, and it actually is pretty easy. And I talked about this in a previous episode but I'll just mention that there have been shown to be important, positive effects on cognition, on even grip strength and physical performance, for people that are early morning risers,

01:37:38 Behavioral Tools for 3 Daily Critical Periods

and that's especially true for night owls that deliberately shift themselves to become early risers. Okay, so that's a lot of information and a lot of tools and I suppose the one set of tools that I really didn't drill into too deeply, the ones related to jet lag and shift work. And again, please check out the episode on jet lag and shift work if that's relevant to you. But I think for most people who are going to sleep at night and are trying their best to sleep well at night and are trying their best to wake up in the morning at whatever hour and stay alert and focused throughout the day, maybe with a brief nap, the tools that I talked about today related to light, temperature, food, exercise, caffeine, supplements, and digital tools, I'm hoping will prove to be very useful for you. They certainly are all supported by excellent peer-reviewed research. And I should just emphasize again that most of the tools we talked about are completely zero cost. So while the supplements and some of the digital tools do carry some cost to them, I really want to encourage everybody to get your behaviors right. Get all of the things related to your timing of exercise and type of exercise in the best possible order and time of day. We talked about this critical period early in the day and then another critical period in the middle of the day and the late afternoon and then this third critical period in the middle of the night. Different tools for the different three critical periods. I promise that if you start

to implement some, or ideally, all of these tools, the quality of your sleep will increase tremendously. And of course, in doing so, the quality of your daytime alertness and your ability to focus will improve tremendously. Again, sleep is the absolute foundation of your mental health, your physical health, and your performance in all endeavors. So if there's one area of your life to really focus on and try and optimize, if your goal is to be happier and more productive and just to have a better life overall,

01:39:26 Zero-Cost Support, YouTube Feedback, Huberman Lab Clips, Spotify & Apple Reviews, Sponsors, Momentous Supplements, Instagram, Twitter, Neural Network Newsletter

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