

Dr. Matthew Walker: The Science & Practice of Perfecting Your Sleep | Huberman Lab Podcast #31

In this episode, my guest is Dr. Matt Walker, Professor of Neuroscience and Psychology and the Founder & Director of the Center for Human Sleep Science at the University of California, Berkeley. He is also the author of the international best-selling book *Why We Sleep* and the host of "The Matt Walker Podcast." We discuss the biology of sleep, including its various stages and what specifically happens to those stages when we don't get enough sleep. We also discuss the effects of sunlight, caffeine, alcohol, naps, hormones, exercise, marijuana, sexual activity, and various supplements on sleep. The episode consists of both basic science information and many science-supported actionable tools.

#Sleep #MatthewWalker #HubermanLab

Dr. Matthew Walker:

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Twitter - <https://twitter.com/sleepdiplomat>

Instagram - <https://instagram.com/drmattwalker>

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- Welcome to the Huberman Lab Podcast, where we discuss science and science based tools for everyday life. I'm Andrew Huberman, and I'm a professor of neurobiology and ophthalmology at Stanford School of Medicine. Today I have the pleasure of introducing Dr. Matthew Walker as our guest on the Huberman Lab podcast. Dr. Walker is a professor of neuroscience and psychology at the University of California, Berkeley. There, his laboratory studies sleep. They study why we sleep, what occurs during sleep, such as dreams and why we dream, learning during sleep, as well as the consequences of getting insufficient or poor quality sleep on waking states. Dr. Walker is also the author of the international best selling book "Why We Sleep". Our discussion today is an absolutely fascinating one for anyone that's interested in sleep, learning, or human performance of any kind. Dr. Walker teaches us how to get better at sleeping. He also discusses naps, whether or not we should or should not nap, whether or not we can compensate for lost sleep, and if so how to best do that. We discuss behavioral protocols and interactions with light, temperature, supplementation, food, exercise, sex, all the variables that can impact this incredible state of mind and body that we call sleep. During my scientific career, I've read many papers about sleep and attended many seminars about sleep yet my discussion with Dr. Walker today revealed to me more about sleep, sleep science and how to get better at sleeping than all of those papers and seminars combined. I'm also delighted to share that Dr. Walker has started a podcast. That podcast entitled "The Matt Walker Podcast", releases its first episode this month and is going to teach all about sleep, and how to get better at sleeping.

00:02:00 Sponsors: Roka, InsideTracker, Belcampo

So be sure to check out the Matt Walker podcast on Apple, Spotify or wherever you listen to podcasts. Before we begin, I'd like to mention 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 of 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 ROKA. ROKA makes sunglasses and eyeglasses that are of the absolutely highest quality. The company was founded by two all American swimmers from Stanford and everything about the design of their glasses is with performance in mind. I've spent my career studying the visual system and how it works and I can tell you that ROKA glasses take into account the science of the visual system such that whether or not you're wearing them on a very bright day, or you walk into a shadowed area or there's cloud cover, you can still see everything with perfect clarity. That also reflects the fact that the lenses that they use are of the absolute highest optical quality. The other terrific thing about ROKA sunglasses and eyeglasses is that they're designed to be worn in all conditions. You can use them while running, while cycling, even if you get sweaty, they won't slip off. And they look great. One problem I have with a lot of so called performance eyeglasses and sunglasses out there is that they look crazy. They make people look like cyborgs. ROKA glasses have a terrific aesthetic, you can wear them to dinner, you can wear them at work, and you can wear them in all sorts of sports activities. If you'd like to try ROKA glasses, you can go to ROKA, that's roka.com and enter the code Huberman to save 20% off your first order. That's ROKA roka.com and enter the code Huberman at checkout. Today's podcast is also brought to us by InsideTracker. InsideTracker is a personalized nutrition platform that analyzes data from your blood and DNA to help you better understand your body and then reach 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 DNA tests, you can also get insight into your immediate and long term health by way of understanding your DNA. One issue with many DNA and blood tests, however, is that you get the numbers back about metabolic factors, hormones, genes, et cetera, but there's no directive as to what to do with that information. With InsideTracker, they have a very easy to use dashboard, and that dashboard not only gives you your numbers, but it gives you simple directives related to nutrition, supplementation, exercise and other lifestyle factors that allow you to move those numbers into the ranges that are right for you and your health goals. If you'd like to try InsideTracker, you can go to insidetracker.com/Huberman and if you do that, you'll get 25% off any of InsideTracker's

plans, just use the code Huberman at checkout. Today's episode is also brought to us by Belcampo, Belcampo is a regenerative farm in Northern California that raises organic grass fed and finished certified humane meats. I don't eat a lot of meat, I eat meat about once a day, but when I do, I make sure that it's high quality and both humanely and sustainably raised. Conventionally raised animals are confined to feedlots and eat a diet of inflammatory grains, but Belcampo's animals graze on open pastures and seasonal grasses, resulting in meat that's higher in nutrients and healthy fats. Now, I've talked many times before on this podcast about how getting sufficient levels of omega threes is very important for metabolic health, hormone health, mood, essentially all aspects of one's health. Belcampo meats have high levels of omega threes, because of the grasses they feed on. The way Belcampo raises its animals isn't just better for our health, it also has a positive impact on the environment. They practice regenerative agriculture, which means that their meat is climate positive and carbon negative, meaning it's good for you, and it's good for the environment. You can order Belcampo's sustainably raised meats to be delivered to you using my code Huberman by going to belcampo.com/Huberman

00:06:00 What Is Sleep?

and if you do that, you'll get 20% off your first order. I'm a big fan of their keto meatballs I also really liked their boneless rib eyes, I eat those pretty much once a day. Again, that's Huberman for the code. And it's belcampo.com/huberman for 20% off your order. And now my discussion with Dr. Matt Walker. Great to finally meet you in person. - Wonderful to connect. I mean, it's been too long, but I suspect it would have been a shorter time before we'd met lest the pandemic, thank you for coming up. - No, thank you, yeah, I'm delighted that we're finally sitting down face to face. I've been tracking your work both in the internet sphere, and I read your book and loved it. And also from the perspective of science, you actually came to Stanford couple of years ago and gave a lecture for BrainMind. - Oh, yeah, yeah, yeah, yeah. - And there, of course, you talked about sleep and its utility and its challenges and how to conquer it, so to speak. Let's start off very basic, what is sleep? - Sleep is probably the single most effective thing you can do to reset your brain and body health. So that's a functional answer in terms of, you know, what is sleep in terms of its benefits. Sleep as a process though, is an incredibly complex physiological ballet. And if you were to recognize or see what happens to your brain and your body at night, during sleep, you would be blown away. And the paradox is

that most of us, and I would think this too, you know, if I wasn't a sleep scientist, we go to bed, we lose consciousness for seven to nine hours, and then we sort of wake up in the morning, and we generally feel better. And in some ways that denies the physiological and biological beauty of sleep. So upstairs in your brain, when you're going through these different stages of sleep, the changes in brainwave activity are far more dramatic than those that we see when we're awake. And we can speak about deep sleep and what happens there, REM sleep is a fascinating time, which is another stage of sleep, often called dream sleep, which is rapid eye movement sleep, that stage of sleep some parts of your brain are up to 30%, more active than when you're awake. So again, it's kind of violating this idea that our mind is dormant. And our body is just simply quiescent and resting. So I would happy to just sort of double click on either one of those, and also what changes in the body as well. But it is an intense evolutionary adaptive benefit and system. That said, though, I would almost push back against an evolved system when we think about the question of sleep and what sleep is. Our assumption has always been that we evolved to sleep. And I've actually questioned that and I have no way to get in a time capsule and go back and prove this, but what if we started off sleeping, and it was from sleep, that wakefulness emerged? Why do we assume that it's the other way around? And I think there's probably some really good evidence that sleep may have been the proto state, that it was the basic fundamental living state. And when we became awake, as it were, we always had to return to sleep. You know, in some ways, at that point, sleep was the price that we paid for wakefulness. And that's another way of describing what sleep is. But again, I think it sort of denies that the active state of sleep, it's not a passive state of sleep either. And then finally, you can say what is sleep across different species? And in us human beings, and in all mammalian species and avian species as well, sleep is broadly separated into these two main types. And we've got non rapid eye movement sleep on the one hand, and then we've got rapid eye movement sleep on the other. And we can speak about how they unfold across a night and their architecture because it's not just intellectually interesting from the perspective of what sleep is, it's also practically impactful for our daily lives. And I'd love to sort of go down that route too.

00:10:20 REM (Rapid Eye Movement) aka 'Paradoxical Sleep'

But you navigate, you tell me I can. - No, no, let's definitely go down that route. So you

mentioned how active the brain is, during certain phases of sleep. When I was coming up in science, REM sleep, rapid eye movement sleep was referred to as paradoxical sleep, is that still a good way to think about it? Paradoxical because the brain is so active, and yet we are essentially paralyzed, correct? - Yeah, it really is a paradox. And where that came from was simply the brainwave recordings, that if all I'm measuring about you, is your brainwave activity, it's very difficult for me sitting outside of the sleep laboratory room to figure out, are you awake, or are you in REM sleep? Because those two patterns of brain activity are so close to one another, you can't discriminate between them. Yet, the paradox is that when you are awake, I go in there and you're sort of sitting up, you're clearly conscious and awake. But yet, when you go into REM sleep, you are completely paralyzed. And that's one of the I think that's part of the paradox. But the paradox really just comes down to two dramatically different conscious states. Yet, brain activity is dramatically more similar than different. And the way I can figure out which of the two you are in is by measuring two other signals, the activity from your eyes and the activity from your muscles. So when we're awake, we will occasionally have these blinks, and we'll have sort of seek heads. But during REM sleep, you have these really bizarre, horizontal shuttling eye movements that occur. And that's where the name comes from rapid eye movements. - Are they always horizontal? - Mostly, they are horizontal. - That's interesting. - And that's one of the ways that we can differentiate them from other waking eye movement activity, 'cause it's not always like it can be sometimes horizontal, but can also have diagonal and also vertical in that plane. But then the muscle activity is the real dead giveaway, just before you enter REM sleep, your brainstem, which is where the dynamics of non REM and REM are essentially played out and then expressed upstairs in the cortex and downstairs in the body, when we go into REM sleep, and just a few seconds before that happens, the brainstem sends a signal all the way down the spinal cord. And it communicates with what are called the alpha motor neurons in the spinal cord which control the voluntary skeletal muscles. And it's a signal of paralysis. And when you go into dream sleep, you are locked into a physical incarceration of your own body. - Amazing. - You know, why would Mother Nature do such a thing? And it's in some ways very simple. The brain paralyzes the body so that the mind can dream safely. Because think about how quickly we would have all been popped out of the gene pool. You know, if I think I'm, you know, one of the best skydivers who can just simply fly, and I've had some times those dreams, too, you know, and I get up on my apartment window, and I leap out. - You're done. - You're done, you

know. So that's one of the sort of that's part of the paradox of REM sleep, both it's brain activity similarity, despite the behavioral state being so different and this bizarre lockdown of the sort of brain of the body itself. Now, of course, the involuntary muscles thankfully aren't paralyzed. So you keep breathing, your heart keeps beating. - Is this why men have erections during REM sleep, and women have vaginal lubrication during sleep? - That's one of the reasons part of the other reason though there is because of the autonomic activity. So there is a nervous, a part of our nervous system called the autonomic nervous system, and it controls many of the automatic behaviors. And some of those are aspects of our reproductive facilities. During REM sleep, what we later discovered is that you go through these bizarre what we call autonomic storms, which sounds dramatic, but it actually is when you measure them. That you'll go through periods where your heart rate, decelerates and drops and your blood pressure goes down and then utterly randomly, your heart rate accelerates dramatically, and what we call the fight or flight branch of the autonomic nervous system or the sympathetic nervous system, badly named 'cause it's anything but sympathetic, it's very aggravating, that all of a sudden fires up and then it shuts down again. And it's not in any regular way. And it's when you get those autonomic storms, you get very activated from a physiologic perspective that you can have these erections and you have vaginal discharge et cetera. - But you're totally paralyzed? - But you are still paralyzed. There are only two voluntary muscle groups that are spared from the paralysis, bizarre. One, your extra ocular muscles, because if they were paralyzed, you wouldn't be able to have rapid eye movements. And the other that we later discovered was the inner ear muscle. And we've got no good understanding as to why those two muscles groups are spared from the paralysis. It may have something to do with cranial nerve but I don't think it's that, I think it's perhaps something more sensory related. Some people have argued that the reason the eyeballs are spared from the paralysis is because if your eyeballs are left for long periods of time, inactive, you may get things such as oxygen sort of issues in the aqueous or vitreous humor. And so the eyeballs have to keep draining. - The drainage systems of the anterior eye are made to require movement. - Exactly. - People with glaucoma have deficits in drainage

00:16:15 Slow Wave Sleep aka 'Deep Sleep'

through the anterior chamber, but there I'm speculating. I'm also speculating, when I ask

this, I would imagine that there are states in waking that also resemble slow wave sleep, or rather that there are states that slow wave sleep also resembles waking states. You've beautifully illustrated how REM sleep can mimic some of the more active brain states that we achieve in waking. What sort of waking state that I might have experienced or experience on a daily basis might look similar to slow wave sleep, non REM sleep, if any? - It's a genius way of thinking about it turns the tables I love it. We almost never see anything like the true ultra slow waves of deep non REM sleep. So we spoke about these two stages non REM and REM. Non REM is further subdivided into four separate stages, stages, one through four, increasing in their depth of sleep. So stages three and four that's what we typically call deep non REM sleep. Stages one and two light non REM. - So maybe take me through the arc of a night just so that. So I put my head down, well, for you, what time do you normally go to sleep? - So I'm usually sort of around about 10:30pm guy. And usually I'll naturally wake up sort of a little bit before 7:00, sometimes before 6:45 or 7:00, I have an alarm set for 7:04am. - You heard it here, folks Matt Walker does use an alarm clock. - I rarely, rarely I'm usually sort of. - He doesn't recommend it, but he does use it. - Yeah, I usually. - You're human after all. - Oh, I am so human. And I've had my sleep issues and I'd love to speak about that too. But it's only just, you know, in the event that, you know, 'cause I like to keep regularity too. You've got to keep those two things in balance. And 7:04 just because, you know, why not be idiosyncratic. I don't know why we always set things on these hot numbers. So yep so when you. - So you go to sleep around 10:30, so using you as an example, because I imagine a number of people go to sleep at different times. But 10:30 is about when I go to sleep, 11 is for me. But so you go to sleep at 10:30, so for that first, let's say three hours of sleep, what does the architecture of that sleep look like as compared to the last three hours of your sleep before morning? - Yeah, so I should note that that sort of, you know, 10:30 to 7:00 that's just based on my chronotype and my preferential it's different for different people. I'm not suggesting that that's the perfect sweet spot for humanity's sleep. It's just my natural sweet spot. - But I imagine most people probably go to sleep somewhere between 10pm and midnight. - It's somewhere between 9 and midnight. - And most probably wake up between 5am and 7am or 5:30 and 7:30. - Yeah, yeah at least in if you look at sort of first world nations, that's a typical sleep profile. So when I first fall asleep, I'll go into the light stages of non REM sleep stages one and two of non REM. And then I'll start to descend down into the deeper stages of non REM sleep. So after about maybe 20 minutes, I'm starting to head down into stage three non

REM and then into stage four non REM sleep. And as I'm starting to fall asleep, as I've cast off from the usually with me, murky waters of wakefulness, and I'm in the shallows of sleep stages one and two, my heart rate starts to drop a little bit. And then my brainwave pattern activity starts to slow down. Normally when I'm awake, it's going up and down, maybe 20, 30, 40, 50 times a second. As I'm going into light, non REM sleep, it will slow down to maybe 15, 20 and then really starts to slow down down to about sort of 10 or eight cycles per second, eight cycle waves per second. Then as I'm starting to move into stages three and four, non REM sleep, several remarkable things happen. All of a sudden, my heart rate really does start to drop. Oh, and I'll come back to temperature, I'm going to write temperature down 'cause I always forget these things. Now I'm solidly in the foothills of middle age. So as I'm starting to go into those deeper stages of non REM sleep, all of a sudden, hundreds of thousands of cells in my cortex all decide to fire together and then they all go silent together. And it's this remarkable physiological coordination of the likes that we just don't see at during any other brain state. - That's really interesting, other than recordings from the brains of animals and a little bit from humans, I don't think I've ever seen the entire cortex or even entire regions of cortex light up like that. - Yeah, it's stunning. It's almost like this beautiful sort of mantra chant, or this sort of, you know, it's a slow inhale and then a meditative exhale, inhale, exhale. And these waves are just enormous in their size. - And the body is capable of movement at this time, there is no paralysis. - There is no paralysis, but for the most part, muscle tone has also dropped significantly. - Interesting. - At that point. And then you will, or I will then stay there for about another 20 or 30 minutes. So now I'm maybe 60, or 70 minutes into my first sleep cycle. And then I'll start to rise back up, back up into stage two non REM sleep. And then after about 80 or so minutes, I'll pop up, and I'll have a short REM sleep period, and then back down, I go again, down into non REM, up into REM. And you do that reliably, repeatedly, and I will be doing that, and I do do that every 90 minutes. At least that's the average for most adults, it's different in different species. What changes to your question is the ratio of non REM to REM within that 90 minute cycle as you move across the night. And what I mean by this is, in the first half of the night, the majority of those 90 minute cycles are comprised of a lot of deep non REM sleep, that's when I get my stage three and four of deep non REM sleep. Once I push through to the second half of the night, now that seesaw balance changes. And instead, the majority of those 90 minute cycles are comprised either of this lighter form of non REM sleep, stage two non REM sleep, and much more and increasingly more rapid eye

movement sleep. And the implication that I was sort of speaking about pragmatically is, let's say that I have to, and I usually never do early morning flights or red eyes, just because I'm a mess if that happens, I'm not suggesting other people shouldn't. - I'm suggesting people not do that. Every time I've taken a red eye or I've done that two or three days later, I get some sort of general feeling of malaise, my brain doesn't work as well, I think red eyes should be abolished. For the pilots too I mean, and for the. - And we can speak about those, there's data. - And for the emergency room, I mean, long shifts have been shown to lead to, you know, physician induced errors that lead to a lot of fatalities. I mean, there are a lot of reasons why staying up too long, or being up at the wrong times, if you're not adapted to it is just terrible. - You have the data and all of those cases, you know, particularly physicians too there was some recent data looking at suicidality. And the rates of suicide in training physicians are, you know, far, far above the norm. And I don't suspect that, you know, the schedules are helping them I suspect that sleep is a missing part of that explanatory equation, but. - I teach medical students and they they're phenomenal, but yeah, they're under extremely challenged conditions. - We shouldn't put them under those conditions. - [Andrew] No, it's not optimizing performance, I have one. - But sorry, I was sorry.

00:24:00 Compensating For Lost Sleep

- No, no, this is important. These it's an important digression. I have one question, which is you're saying that as across the night, a greater percentage of these 90 minute cycles are going to be occupied by REM sleep as you progress through the night. I'm aware that, based on work that you've done and from your public education efforts and others that we have so called circadian forces, and we have other forces that are driving when we sleep and when we want to sleep, etcetera. Without going into the details of those, I've a simple question, the experiment is the following. Let's say, God forbid, you are prevented from going to sleep at your normal time and you stay up for the four hours or five hours that normally you would be in predominantly slow wave sleep. - If let's say you finally get to lie down at 3am a time when normally your sleep would be occupied mostly by rapid eye movement sleep, will you experience a greater percentage of rapid eye movement sleep because of these so called circadian forces, meaning that's what's appropriate for that time? Or will your system need to start at the beginning of the race that were, as I'm referring to it, that we're calling sleep? And for if that's not clear to

anybody, basically, what I'm asking is, if you are forced to skip the slow wave sleep part of the night, will your system leap into rapid eye movement sleep? Or does it have to start at the beginning and get slow wave sleep first? In other words, does one sleep state drive the entry to the next sleep state? - Great question, so there is some degree of reciprocity between the sleep states I should note that when we drive one of those up, we often but not always see a change in the other. There are some pharmacologies that have shown an independence to that. And we've also played around with things like temperature, and sometimes you can, you know, nudge one and not seem to upset or perturb the other. But to your, I think, lovely point, the answer is, it's a mix, but it's mostly the latter. Meaning you will mostly go into your REM sleep phases, and be significantly deficient in your deep sleep. So just because I start my sleep cycle at 3am, rather than at 10:30pm, it doesn't mean that my brain just says, well, I've got a program, and I'm just going to run the program, and the way the program runs is that we always start with a first couple of hours of deep sleep. So we're just going to begin act number one, scene one, it doesn't do that. Now, I will get some deep sleep to begin with and part of that is just because of how sleep works. Based on how long I've been awake, longer I'm awake, there is a significantly greater pressure for deep sleep. But we actually use exactly what you just described as an experimental technique to selectively deprive people of one of those stages of sleep or the other. So we will do first half of the night deprivation, and then let you sleep the second half. So that means that you will be mostly deep sleep deprived, and you will still get mostly all of your REM sleep. And then we switch it, so you only get your first four hours, which means you will mostly get deep non REM sleep, but you will get almost no REM sleep. So in both of those groups, they've both had four hours of sleep. So the difference between them in terms of an experimental outcome is not the sleep time because they both slept for the same amount. It's the contribution of those different stages. Now, we actually have more elegant methods for sort of selectively going in there and scooping out different stages of sleep. But that's the way we used to do it old school was just using this timing difference. - And who suffers more? Those that lack the early phase, and were those that lack the later phase of the night sleep? In other words, if I have to sleep only four hours for whatever reason, am I better off getting the early part of the night's sleep or the second half of the night sleep? - Depends on what the outcome measure is. - So that gets right to the differences between slow wave sleep and REM. - Right. - I was probably misinformed. But my understanding a very crude understanding I should say before. - I

very much doubt I'll contrary with someone like you. - Which is that's very nice of you. The first part of the night the slow wave sleep is restorative to the musculature to motor learning, and that the dream content tends to be less emotional. The second half of the night, being more emotional dreams and sort of the unpairing of the emotional load of our previous day and other experiences. So in other words, if I were to deprive myself, excuse me of REM, I would be hyper emotional, not maybe not as settled with the kind of experiences of my life. Whereas if I deprive myself of slow wave sleep, I would feel a more physical malaise. Is that correct? Or is that far too simple? And if it is too simple, please tell me where I'm wrong? - No, I think much of that is correct. And it's sort of that plus. So for example, during deep non REM sleep, that's where we get this. It's almost a form of natural blood pressure medication. And so when I take that away from you, the next day, we're usually going to see autonomic dysfunction, we're usually going to see abnormalities in heart rate blood pressure. We also know that during deep non REM sleep, that there is a certain control of specific hormones. For example, we know that the insulin regulation of sort of metabolism, meaning how will you look from a regulated blood sugar perspective versus dysregulated, pre diabetic look of profile. That's where deep sleep seems to matter if we selectively deprive you of that we can see. - Growth hormone. - Growth hormone is different actually. So that's a beautiful demonstration where growth hormone seems to be more REM sleep dependent. And that's why we can come on to the effects of alcohol and there's some really impressive frightening data on alcohol and it's disruption of sleep. But then we also know testosterone, peak levels of testosterone happen during REM sleep. - So the second half of the night, essentially. - Which is the second half of the night. So it really just means that the, your profile of mental and physical dysfunction will be different under both of those conditions. Which one would you prefer? I would prefer neither of them. And it really depends on what you're trying to optimize for. So it's just so complicated, sleep is just so pluripotent, you know, it's so physiologically systemic, that it's almost impossible not to undergo one of those two things, just deep sleep deprivation, or just REM sleep deprivation, and not show a profile that you would really prefer to avoid. And that's the reason from an evolutionary standpoint, that we've preserved those stages of sleep. I mean, sleep is just so idiotic, you know, from an evolutionary perspective. - Or maybe waking is idiotic. - Or waking is, you know, well, yeah. - Based on your previous idea. - Who've you been talking to? I think that comment is very specific to me. Yeah, I am normally always an idiot when working. But I think this idea that sleep, you know, is so profoundly

detrimental to us, if you were to take it at face value, you know, you're not finding a mate, you're not reproducing, you're not foraging for food, you're not caring for you're young and worst of all, you're vulnerable to predation, on any one of those grounds sleep probably should have been selected against. But it wasn't sleep has fought its way through heroically every step along the evolutionary path. And therefore, every sleep stage has also survived as best we can tell. What that means is that those are non negotiable. If mother nature had found a way to even just sort of, you know, thin slice some of that sleep from us, there would have been vast, I'm sure evolutionary benefits, but looks as though she hasn't.

00:32:20 Waking in the Middle Of The Night

And I'm usually in favor of her wisdom after 3.6 million years, so. - Yeah, it's incredible. I want to introduce a another Gedankenexperiment, other thought experiment. So in this arc of the night, slow wave sleep predominates early in the night, and then REM sleep. There's a scenario that many people including myself experience on a regular basis. Which is they go to sleep, sleeping just fine, three, four hours into it, they wake up. They wake up, for whatever reason, maybe there was a noise, maybe the temperature isn't right, we will certainly talk about sleep hygiene, etcetera. They get up, they go to the restroom, they might flip on the lights, they might not, they'll get back in bed hopefully they're not picking up their phone and starting to browse and wake up the brain through various mechanisms light and cognitive stimulation, etcetera. They go back to sleep, let's say after about 10, 15 minutes, they're able to fall back asleep. And then they sleep till their more typical wake time. How detrimental is that wake up episode or event in terms of longevity, learning, et cetera? I would love to sleep the entire night through every night, but most nights I don't. And yet, I feel pretty good throughout the day, some days better than others. So if you were to kind of evaluate that waking episode, and compare it to sleeping the whole night through, what are your your thoughts on that? - So I think if you're waking up sort of frequently, as you're describing, I would probably get your estate in order because my guess is within the next year, you're going to be you're going to be done for, no I'm kidding you. Absolutely kidding you. It is perfectly natural and normal, particularly as we progress with age, you know, children tend to have typically more continuous sleep. Now it's not that they aren't waking up for brief periods of time they are and in fact, we all do. When we come out the other end of our sleep cycle at the

end of our REM sleep period of the 90 minute cycle, almost everybody wakes up and we make a postural movement, we turn over because we've been paralyzed for so long and the body will also like to shift it's weight or position. - Do we ever look around? Ever open our eyes and look around? - You, sometimes people will open their eyes, but usually it's only for a brief period of time and they usually never commit those awakenings to memory. Your situation and it's my situation as well, I usually now at this stage of life, I don't sleep through the night. I'll usually have a bathroom break and then I'll come back. That's perfectly normal. We tend to forget that in sleep science, we think of sleep efficiency so of the total amount of time that you're in bed, how much of that percent time is spent asleep? And we usually look to numbers that are above 85%, or more as a healthy sleep efficiency. So if you're to think about me going to bed and I spend, you know, let's say, eight and a quarter, eight and a half hours of time in bed, with a normal, healthy sleep efficiency, I still may be only sleeping a total of seven and a half hours, or seven and three quarter hours. Meaning that I'm going to be awake in total, not in one long about, but I'm going to be awake for upwards of 30 minutes, net some time. Sometimes that can be after a 10 minute, you know, dalliance after having gone to the bathroom, and I'm just gradually drifting back off again. Other times, it will just be for a couple of minutes. And most of those you don't commit. So I think we need to stop, we don't need to get too worried about, you know, periods of time awake, just because we're not sleeping throughout the night. I would love to do that, too. And I remember when that used to happen, and it still happens occasionally. - Every once in a while, it feels great when it does happen. - And it's a lovely thing. - It's a surprise right? Like oh my goodness I slept through the whole night. - It is now a surprise, yeah it is a surprise. But for the most part, I think we can be more relaxed about that where we have to be a bit more attentive, though, is if you're spending long periods of time, not being able to get back to sleep. And usually we define that by saying, if it's been 20, 25 minutes, normally, that's the time when we would really say okay, let's explore this, what's going on? Let's see what's happening. The other thing is if it's happening very frequently, so even if you're, you know, not awake for 25 minutes stretches, but you're finding yourself waking up and being consciously aware that you've woken up for maybe six, seven or eight times throughout the night and your sleep is very what we call fragmented the great science of sleep in the past five or 10 years has been yes, quantity is important, but quality is just as important. And you can't have one without the other in terms of a good beneficial next day outcome. You can't just get four hours of sleep, but brilliant quality of

sleep and be unimpaired. Nor can you get eight hours of sleep, but have very poor quality of sleep and be unimpaired the next day. So that's why I just sort of want to asterisk, this idea of let's not get too worried about waking up and having some time awake, that's perfectly normal and natural. But if it's happening very frequently throughout the night, or those periods of time, or long stretches of time, upwards of 25 minutes, then let's look into it. - Well, I can assure you just helped a lot of people feel better about this waking up episode that I and many other people experience. - I hope so 'cause I think it's really important that we, you know, I think I've been desperately guilty of perhaps, you know, early on being too puritanical about, you know, sleep and I've retrospected, and I've tried to explore why this was the case, you know, it was almost sleep or else, dot, dot, dot. And at the time when I was starting to write the book, which was back in 2016, you know, sleep was still a neglected stepsister in the health conversation of today. And I could see all of the, - That has certainly changed. - And it's changing, you know, and not because it's my efforts, but because of all of my colleagues. - I would say, well, it's great that you give attribution to the other people involved. And of course, it's a big field. But I think you've done a great service by cueing people to the importance of this state, not just for avoiding troublesome outcomes, but also for optimizing their waking state. It's really, you know, I view sleep as this period that feels good, but we're not aware of how it feels when we're in it necessarily. It has tremendous benefits when you're doing it well, so to speak, and it has tremendous deficits when we're not. And I think it was an important thing for you to do to cue people to this issue. And I would say mission accomplished, that people are aware of the need for sleep. I think that knowing that waking up in the middle of the night is normal, provided it's not too frequent is great and will also help people

00:39:48 Uberman (Not Huberman!) Sleep Schedule

who may have been overly concerned about that. I do want to use this as an opportunity to raise something about the so called Uberman schedule not to be confused with the Huberman schedule. Fortunately, no one has confused those yet. Some years ago, there was a discussion about the so called Uberman schedule, meaning the Superman schedule. So that's Huberman without an H, which I have nothing to do with. If you read your Nietzsche this will have a subtext. But regardless, the Uberman schedule, as I understand is one in which the person elects to sleep in 90 minute, bouts spread

throughout the day and night, in an attempt to get more productivity and or reduce their overall sleep need. There was a paper published recently that explored whether or not this is good or bad for us. Maybe you just give us the take home message on that. - Yes, so these Uberman like schedules and there's lots of different forms of that, they tried to essentially pie chart the 24 hour period, into short bouts of sleep with some shorter or no, well, slightly longer periods of wakefulness, then short bouts of sleep then wakefulness. You know, you're, I sort of made it, I think a quip, it's almost like you're sleeping like a baby, you know, 'cause that's the way that babies will sleep. - In 90 minute naps. - That they will have, you know, these brief naps, then they're awake, then they're asleep then they're awake. And to the chagrin of parents across the night, it's basically the same, they're awake, they're asleep, they're awake, they're asleep. And that's more the schedule that these types of protocols have suggested. And there was a really great comprehensive review that found not only that they weren't necessarily helpful, but they were actually really quite detrimental. And on almost every performance metric, whether it be task performance, whether it be physiological outcome measures, whether it even be the quality of the sleep that they were having, when they were trying to get it, all of those were in a downward direction. And it's not surprising if you look at your the way that your physiology is programmed, if you look at the way your circadian rhythm is programmed, none of that screams to us that we should be sleeping in that way. - Well, I'm chuckling because we always hear sleep like a baby. This is how babies sleep. And I would say don't sleep like a baby, sleep like an adult be an adult, get your solid eight hours. - It's Billy Crystal's line, he was, you know, a long standing suffering insomniac, he says I sleep like a baby, I'm awake every 20 minutes. You know, and I think this is another one of those demonstrations that when you fight biology, you normally lose. And the way you know you've lost is disease, sickness and impairment. And I think if you sleep, in accordance with the natural biological edict that we've all been given, life tends to be both have a higher quality and a longer duration.

00:42:48 Viewing Morning SUNLight

- Yeah, I agree. Along those lines, as a vision scientists, I've been very excited by the work on these non image forming cells in the eye, the so called melanopsin cells that inform the brain about circadian time of day. And I'm a big proponent of people getting some sunlight, ideally sunlight, but other forms of bright light in their eyes early in the

day and when they want to be awake. Essentially, during the phase of their 24 hour circadian cycle when temperature is rising, and then starting to get less light in their eyes as our temperature is going down in terms of later in the day and in the evening. Are there any adjustments to that general theme that you'd like to add? Or is in any way? - No, I think that's exactly what we recommend right now. Which is try to get at least 30 to 40 minutes of exposure to some kind of natural daylight. Now, there may be parts of the world where, you know, it's. - You're from your from a rather cloudy part of the world. - I am from Liverpool, England, and the Northwest of England is not known for its beach resorts and fine weather. I remember I sort of, I went back home for a trip when I'd first been out in California, and I thought, why is the sky so low? Just you know, constantly we joke that in the UK, we usually have nine months of bad weather and then three months of Winter. And then that's your entire year in terms of climate. But to come to your point, you're exactly right, try to get that daylight. Now it can be you know, working next to a window and you're getting that natural sunlight. But that natural sunlight is even on a cloudy day in England is usually far more potent than anything that you'll get from indoor lighting, despite you thinking sort of from a perception wise, maybe the much closer than I would think. - Yeah, I've been I'm sorry to interrupt. I've been a big proponent of there's a an app called Light Meter, which will it's a free app, I have nothing to do with it that will allow you to get a pretty decent measurement of the amount of light energy coming toward you. And if you hold it up to a cloudy morning, where you don't think it's very bright out kind of a dismal day, you'll notice that there'll be 1,000, 2,000, even you know, 5,000 Lux, Lux just being a measure of brightness, of course. And then you can point the same light meter toward an indoor light that seems very bright and very intense and it'll say 500 Lux and you realize that the intensity as we gauge it, perceptually is not really what the system is receiving. So outdoor light is key. How do you get this natural stimulation? Or I should just say light stimulation early in the day, what is your typical, what does Matt Walker do to get this light stimulation? - I am no poster child, but usually I will, if I'm working out I usually work out most days. And I shopped around and I found a gym that has huge amounts of window exposure facing to the East. This is going to sound so ridiculous you know, Matt Walker chooses a gym on the basis. - I love it - Of the solar impact so he cannot you know correct his circadian. - There are a lot of criteria for selecting gyms, this one is actually grounded in physiology, and biology and so. - And selfishness about my own sleep. - No it's great. So you get the your exercise and your light stimulation simultaneously? - That's right, yep, yeah. - And

so you're stacking cues for wakefulness early in the day. - Exactly, so both exercise and daylight are wonderful cues for circadian rhythm alignment, and also circadian rhythm reset each day. And so I will use both exercise, I mean, I'm neither a strong morning type or a strong evening type. And my preference to exercise is probably sometime in the middle of the day, probably somewhere around 1pm sorry, not 1am. But I'm usually working out probably around the sort of seven, sort of 45 8am time, that's usually when I'll start my workout. And there I will start with cardio spin bike facing a window. And luckily, for the most part here in California, there's usually sunlight coming through. But it doesn't matter to me because just as you said, even when it's a cloudy day that Lux coming through of light, the intensity is splendid. So I would prefer to favor my exercise just because for efficiency too, I want to get also working on the day, I'll try to match my exercise more with my circadian light exposure than I would probably if I'm going to do I really want to crush a workout, or do I want to just, you know, make sure it's a good workout? I would prefer to work out, you know, at a different time. But I like that because of the daylight. And we can speak about exercise timing at some point, because there's a lot of discussion around that, when is the right time to exercise during sleep. And we can sort of bust some myths there too. So I think you're spot on with the suggestion, get some morning daylight, try to get that exposure, usually at least 30 to 40 minutes, there was some great work recently coming out in the occupational health domain, where they moved workers from offices that were just facing walls and you know, didn't have any exposure to natural daylight. And then they did a time period during that study where they actually were in front of a window and working. And they measured their sleep and their sleep time and their sleep efficiency increased quite dramatically. I'm forgetting the numbers now but I think the increase in total sleep time is well over 30 minutes. And the improvement in sleep efficiency was five to 10%. You know, and if you're batting an 80%, you know, sleep efficiency average, we're a bit concerned about that. But add 10% to that and now you're in you know, a great echelon of healthy sleepers. And all you did was just spend some time working in front of windows. - That's great and probably folks might want to consider spending a little less time with sunglasses provided they can do that safely, you know, driving, etcetera. You're not alone with your exercise behavior and facing East. So the one and only Tim Ferriss told me recently that his morning routine nowadays consists of jumping rope while facing East to get the sunlight stimulation of the eyes. And as Matt and I both know, it has to be of the eyes, right? These portals are the only way

00:49:20 Caffeine

to convey to the rest of the brain and body about the time of day and wakefulness. Along the lines of wakefulness, I have a number of questions about caffeine. The dreaded and beloved caffeine, I love caffeine, but I like it in relatively restricted periods of time. So I'm a big fan of waking up and even though I wake up very groggy, allowing my natural wakefulness signals to take hold, meaning I wake up very slowly, but I don't drink caffeine right away. I sort of delay caffeine by a little while, usually 90 minutes to two hours. And that idea came to me on the basis of my understanding of how caffeine and the adenosine receptor interact. I have a feeling you're going to pronounce adenosine differently than I do. - No, no, I will with that, I will go with adenosine. - I've tried to go with your skeletal instead skeletal and synapse and synapse. - Schedule and schedule. - There we go. But to make it really simple for folks, how does caffeine work to make us feel more alert? And does the timing in which we ingest caffeine play an important role in whether or not it works for us or against us? So maybe we just start with how does caffeine work? Why is it that when I drink mate or coffee, which are my preferred sources of caffeine, do I feel a mental and physical lift? - Yeah so I'm going to suggest counter to what most people would think, drink coffee. - Or mate, is mate okay also? - [Matthew] Yeah, yeah, yeah. - Whatever form you enjoy. - We'll come on to sort of why I suggest that but when it comes to coffee, I would say the dose and the timing makes the poison. So let's start with how caffeine works. Caffeine is in a class of drugs that we call the psychoactive stimulants. So it works through a variety of mechanisms, one is a dopamine mechanism dopamine we often think of as a reward chemical or, but dopamine is also very much an alerting neurochemical, as well. And caffeine has some role it seems to play in increasing dopamine. But its principal mode of action, we believe in terms of making me more alert and keeping me awake throughout the day is on the effects of adenosine. And to explain what adenosine is from the moment that you and I woke up this morning, this chemical adenosine has been building up in our brain. And the longer that we're awake, the more of that adenosine accumulates, - Is it mask, may I ask, is it accumulating in neurons in glia, or in the blood vessels? Where and is it also accumulating in my body? Where is this adenosine coming from? And where is it accumulating? - Yeah, so the adenosine here that we're talking about that is creating the sleep pressure is a central brain phenomenon. And it comes from the neurons

themselves combusting energy. And as they're combusting energy, one of the offshoots of that is this chemical adenosine. And so as we're awake throughout the day, and our brain is metabolically very active, it's accumulating and building up this adenosine. Now, the more adenosine that we have, the sleepier that we will feel. So it really is like a sleep pressure is what we call it. Now, it's not a mechanical pressure, don't worry, your head's not going to explode, it's a chemical pressure. And it's this weight of sleepiness that we feel gradually growing as we get into the evening. - May I just interrupt you again to just ask do we know what the circuit mechanism is for that? I mean, not to go too far down the rabbit hole, but for the aficionados and for myself, we have brain mechanisms like locus coeruleus that are release things that our brain areas locus coeruleus is just being a brain area, of course that release things that proactively create wakefulness. So are those neurons shutting down as a consequence of having too much adenosine? Or are there areas of the brain that promote sleepiness that are getting activated? Because these, you can imagine both things working in parallel, one or the other would accomplish the same endpoint? - Yeah and it's both. And so there are two main receptors for adenosine the A1 receptor and the A2 receptor. And they have different modes of activating brain cells or inactivating or decreasing the likelihood of firing. And adenosine works in this beautiful, elegant way, where it will inhibit and shut down the wake promoting areas of the brain whilst also increasing and dialing up the volume on sleep activating, sleep promoting range. - Biology is so beautiful. - [Matthew] Oh it's fantastic. - There's a push pull, I mean, and we could have a larger discussion at some point about that, everything seeing dark edges seeing light edges. Our ability to smell or to sense pressure on this, everything's a push pull in Biology. - Oh it's great, yeah, yep. - So this is another example where as I am awake longer, adenosine is released in the brain. And my wakefulness areas are being actively shut down by that adenosine and my sleepiness brain areas, so to speak, are being promoted to be more active, is that correct? - That's right and it's a very progressive process. It's not like a step function, where and sometimes that happens occasionally, but it's usually because you've been sort of driving through and as we'll come on to have caffeine in the system, and then all of a sudden you just hit a wall and it just, you know engulfs you and you go from zero to the one of sleepiness within a short period of time. - What explains the fatigue after a hard conversation? The desire to go to sleep or desire to go to sleep during a hard conversation? - That's an interesting one. I think it's usually just based on personality type interactions. And for the most part. - Not that I've ever experienced that before. - No

people with you don't, but with me, they. - Oh no, no, I've experienced the desired to some conversations, I'm halfway through them and I feel like I want to take a nap. - Yeah. - Right. - And I would love to look at you know, people's sleep history. We've sort of seen that time and time again, but and then it could be, you know, with folks like me, people just lose the will to live within about five minutes of speaking with me, so. - Not true, they hear that sleep is important. [cross talking] - Unrelated. - [Andrew] That's awesome. - And that's flattery, that's great. But so the way that then caffeine comes into this equation, as they're saying, it's usually a kind of a linear process. Or maybe it's probably closer to an exponential in terms of your subjective feeling of sleepiness. And we haven't really been able to measure that in humans, because normally, we it's hard to actually, you know, stick something into the brain and be, you know, sucking, siphoning off stuff every couple of minutes, as you could do in animal studies. And keep asking people every couple of minutes, how sleepy do you feel, how sleepy? And track to see if there's a linear rise in, you know, adenosine, which then creates an exponential rise in subjective sleepiness or what the dynamics are, but I'm kind of nerding out. Caffeine comes into play here, because caffeine comes into your system and it latches on to those welcome sights of adenosine the adenosine receptors. But what it doesn't do is latch on to them and activate them. Because if it was doing that, then it would, you know, in lots of ways it would dial up more sort of sleepiness. It does the opposite. The way that caffeine works is that it comes in, competes with quite sharp elbows with adenosine competitively forces them out of the way, hijacks that receptor by latching onto it, but then just essentially blocks it. It doesn't inactivate the receptor, it doesn't activate the receptor, it functionally inactivates it in the sense that it takes it out of the game for adenosine. So it's like someone you know, coming into a room, and you're just about to sit down on the chair, and caffeine comes in and just pulls out the chair. And you're like, well, now I've got nowhere to sit. And caffeine just keeps pulling out the chairs from adenosine and adenosine even though it's at the same concentration in your brain, your brain doesn't know that you've been awake for, you know, 10 hours, 16 hours at that point when you've downed a cup of coffee. Because all of that adenosine that's still there can't communicate to the brain that you've been awake for 16 hours because. - But the adenosine is still in brain circulation. - Correct. - So the real question is what happens when caffeine is dislodged from the adenosine receptor? - Unfortunate things happen. And that's what we call the caffeine crash. Which is caffeine has a half life and it's metabolized and. - Do you recall what the half life is? - Yeah, the half life is

somewhere between five to six hours. And the quarter life therefore is somewhere between 10 to 12 hours. It's variable, different people have different durations of its action, but for the average adult five to six hours. That variation, we understand it's down to a liver enzyme or a set of liver enzymes of the class that we call the cytochrome P450 enzymes. And there are I think last I delved into the data, which is pretty recently, there are two gene variants that will dictate the enzymatic speed with which the liver breaks down caffeine. And that's why you can have some people who are very sensitive to caffeine and other people who say, you know, it just doesn't affect me really that much at all. - These are the people that have a double espresso after a 9pm dinner and can sleep just fine. - Well, and we'll come onto. - Well at least subjectively they think they are sleeping. - Subjectively, yeah, and we should speak about that assumptive danger too. So then the caffeine is in the system and after some time period, it will be inactive in the system. So let's say that, you know, I've been awake for 12 hours now. And it's you know, 8pm and I'm feeling a bit tired, but I want to push through and I want to keep working for another couple of hours, so I have a cup of coffee. All of a sudden I was feeling tired, but I don't feel like I've been awake for 12 hours anymore. Because with the caffeine in the system, maybe only half of that adenosine is being communicated through the receptor to my brain. 100% of the adenosine is still there, only half of it is allowed to communicate to my brain. So now I think oh I haven't been awake for 12 hours, I've just been awake for six hours, I feel great. Then after a few hours, and the caffeine is starting to come out of my system, not only am I hit with the same levels of adenosine that I had before I'd had the cup of coffee several hours ago, it's that plus, all of the adenosine that's been building up during the time that the caffeine has been in my system. - So sort of an avalanche of adenosine. - It is a tsunami wave, yeah and that's the caffeine crash. - And it's interesting because the caffeine crash at two o'clock in the afternoon when you have work to do is a terrible thing. But what about the person, maybe this person is me in my 20s, who says, I'm going to drink caffeine all day long. And then I want the crash. Because at nine or 10pm, if I stop drinking caffeine at say, 6pm, and I crash, then I crash into a slumber, a deep night of sleep. Is that sleep really as deep as I think it is? Because given the half life of caffeine that you mentioned a few moments ago, I have to imagine that having some of that caffeine circulating in my system might disrupt the depth of sleep, or somehow the architecture of sleep in a way that even if I get eight, or who knows even 10 hours of sleep, it might not be as restorative as I would like it to be. - Yeah, and that is the danger, just sort of that, you

know, those people that you described who say, and I, a lot of them will speak with me too say, look, I can have two espressos with dinner and I fall asleep fine and I stay asleep. Because usually those are the two phenotypes that we typically see with too much caffeine. I just can't fall asleep as easily as I want to, or I fall asleep, but I just can't stay asleep. And caffeine can do both of those things quite potently. - How late in the day do you think is assuming somebody, translate this folks, if you go to bed earlier or later, you have to shift the hours accordingly. But given somebody who typically gets into bed around 10:00, 10:30, and falls asleep around 11:00, 11:30. When would you recommend they halt caffeine intake? And these are not strict prescriptives, but I think people do benefit from having some fairly clear guidelines of what might work for them. Would you say cut off caffeine, by what time of the day? - I would usually say take your typical bedtime and count back sort of somewhere between 10 to eight hours is probably getting a little bit close. But take back sort of 10 hours or eight hours of time, that's the time when you should really stop, you know, using caffeine is the suggestion. And the reason is because for those people who even just keep drinking up until you know, into the evening, you're right, that they can fall asleep fine, maybe they stay asleep, but the depth of their deep sleep is not as deep anymore. And so there are two consequences. The first is that for me, and it can be up to by 30%, and for me to drop your deep sleep by 30%, I'd have to age you by between 10 to 12 years, or you can just do it every night to yourself with a couple of espressos. The second is that you then wake up the next morning, and you think, well, I didn't have problems falling asleep and I didn't have problems staying asleep, but I don't feel particularly restored by my sleep. So now I'm reaching for three or four cups of coffee the next morning, rather than just two or three cups of coffee. And so goes this dependency cycle, that you then need your uppers to wake you up in the morning, And then sometimes people will use alcohol in the evening to bring them down because they're overly caffeinated and alcohol, and we can speak about that, too, also has very deleterious impacts on your sleep as well. So you're right that it's not just the quantity of your sleep, or even difficulties falling or staying asleep, it can also be deep sleep. But here again, I think, you know, I don't want to be frightening people. And I mentioned this before, I think one of the real problems that I or mistakes that I made, because I didn't you know, I'd never had much public exposure before the book. And I was so saddened by you know, the disease and the suffering that I was seeing as a consequence of a lack of sleep in our society. And the fact that it wasn't really being discussed very much. I sort of came out, you know, a little bit headstrong,

more than a little bit headstrong. And I think I was, you know, perhaps too much gas pedal and too little, you know, break as it were. And I don't think that's the right way to approach a health message within the public sphere. And I've become much softer in how I think about these things. I have ideas about what the ideal world looks like for sleep. But I also realize that none of us live in this thing called the ideal world. - We certainly don't. - So, you know, I want to be really mindful of that, and I think I've done a really bad job of being sort of too forthright, particularly for people who struggle with sleep, you know, early on, when I would offer these sort of messages about sleep. I want to be, you know, I want to be theoretical when it comes to the science, I want to be faithful to the science. But I also don't want to go out and scare the living daylights out of people, particularly people who are struggling with their sleep, 'cause it's probably only going to make matters worse. So I've been beautifully schooled by learning how to be a slightly better public communicator. I'm nowhere near of the standing that you are, you are very elegant and it's very intuitive to you. I'm still with training wheels, but I'm getting a little bit better. But I just want to say that when I'm speaking about caffeine, 'cause it sounds as though I'm very sort of overt about it. But I will come back to why I say drink coffee. But I just want to make that point. - Yeah, well, I appreciate you making that point. And I'm sure our listeners will too. I still will stand behind my statement, which is that what you've done for the notion that sleep is vital for all aspects of health and for performance, mental and physical and wakefulness, the message and the packaging it was contained in and is has been clearly clearly net positive people needed to be cued to this. - Thank you. - The I'll sleep when I'm dead mentality is one that I had, it's one that other people have. People in a huge number of vital communities, not just your students, but also people that this the messaging that you provided and continue to provide has positively impacted the first responder community, the medical community, there're still steps that need to be taken the military community, and of course, the civilian community. And so I think these adjustments about yeah, caffeine is okay, just restricted to the early part of the day, if you can, most days, I mean, I think the law of averages. It's like the light viewing behavior I think it is critical to view sunlight or natural, some other form of bright light early in the day but if you miss a day, it's not that your whole system is going to dissolve into a puddle of tears. That'll happen on the second or the third day, no I'm kidding, you've got a couple of days. Biology works in averages except with respect to accident or injury. A car accident is a car accident, right? You don't get to have three of those before the brain damage occurs if the accident's severe

enough. But with sleep behavior, these homeostatic type behaviors, or with food, one chocolate sundae, is it going to kill you know? No. Every night? Yeah. It's going to make you demented and kill you early. We know this. And so I think the middle ground is often a hard place to achieve. So I think you've done a phenomenal job. But I appreciate you raising these points. And I think it's clear that we all need to that we all can and should do certain things better,

01:07:54 Alcohol

including being gentle with ourselves from time to time when we deviate from these ideal circumstances. Along these lines, I do want to talk about alcohol because I think caffeine and alcohol represent the the kind of two opposite ends of the spectrum. Clearly there are other stimulants. There your Adderalls and your high energy drinks that people use. But alcohol and caffeine are the most commonly consumed stimulants and sedatives, depressants as they're sometimes called. So what happens when somebody has a glass? We always hear a glass or two of wine in the evening or a cocktail after dinner or before dinner, how does that impact their sleep? And then we'll be sure to circle back in terms of what is reasonable ranges of behavior when it comes to avoiding alcohol or if it's age appropriate, et cetera, enjoying alcohol? - Yeah, so alcohol, if we're thinking about classes of drugs, they're in a class of drugs that we call the sedatives. And I think one of the first problems that people often mistake, alcohol is often used as a sleep aid for people who are struggling with sleep when things like over the counter remedies, etcetera, or herbal remedies have just not worked out for them. And alcohol, unfortunately, is anything but a sleep aid. The first reason that most people use it is to try and help them fall asleep. - So and this process of this event that we call falling asleep, I have to imagine is a process. - It is a process. - Like everything in biology, and that that process involves in some way, as we talked about push pull before turning off thinking, planning, et cetera, and turning on some sort of relaxation mechanism. I have to imagine that these two things are knobs turning in opposite directions that gives us this outcome we call falling asleep. Alcohol, it seems is helpful for some people to turn off their thoughts or their planning. Is that right? - Yes, it is. And so I think, you know, if we look at the pattern of brain activity, if I were to place you inside an MRI scanner, where we're looking at the activity of your brain and watch you drifting off, some parts of your brain will become less active. Other parts will become more active. And this is the push pull

model. It's inhibition excitation. But alcohol is quite different in that regard. Alcohol is because it's a sedative, what it's really doing is trying to essentially knock out your cortex. It's sedating your cortex, and sedation is not sleep. But when we have a couple of drinks in the evening, when we have a couple of nightcaps, we mistake sedation for sleep saying, well, I always when I have a couple of whiskies or a couple of cocktails, it always helps me fall asleep faster. In truth, what's happening is that you're losing consciousness quicker, but you're not necessarily falling naturalistically asleep any quicker. So that's one of the first sort of things just to keep in mind. The second thing with alcohol is that it fragments your sleep. And we spoke about the quality of your sleep being just as important as the quantity. And alcohol through a variety of mechanisms, some of which are activation of that autonomic nervous system, that fight or flight branch of the nervous system. Alcohol will actually have you waking up many more times throughout the night. So your sleep is far less continuous. Now, some of those awakenings will be of conscious recollection the next day, you'll just remember waking up, many of them won't be. And so but yet, your sleep will be littered with these sort of punctured awakenings throughout the night. And again, when you wake up the next morning, you don't feel restored by your sleep, you know, fragmented sleep or non continuous sleep in this alcohol induced way, is usually not good quality sleep, but you feel great on the next day. The third part of alcohol in terms of an equation is that it's quite potent at blocking your REM sleep, your rapid eye movement sleep. And REM sleep is critical for a variety of cognitive functions. Some aspects of learning and memory it seems to be critical for aspects of emotional and mental health. - You've described it before as a sort of self generated therapy that occurs while we sleep. - Yeah, it's overnight therapy, you know, it's emotional first aid. - Certainly people that don't get enough sleep are very easy to derail emotionally. Not that one would want to do that to people, but we all sort of fall apart emotionally. I always think of it as almost like our skin sensitivity can be heightened. - Yes, absolutely. - When we are sleep deprived. Our emotional sensitivity is such that when we're sleep deprived, such that it takes a much finer grain of sandpaper to create that kind of friction, things bother us. - [Matthew] Threshold to trigger. - Even online comments bother us when we're sleep deprived. and never when we're well rested. - I would love to say that I never look at them, except I look at. - Well actually, here I. - [Matthew] Maybe every one of them. - Here I will editorialize because the notion of not looking at comments is unreasonable to ask of any academic, because academics we are all trained to look at our teaching

evaluations. And just like with online comments to ignore 20% of them, no, I'm kidding. We look at them all in any event. So in terms of translating this to behavior, I'm not, I don't particularly enjoy alcohol, I guess I might be fortunate in that sense. But I also have never really experienced the pleasure of drinking alcohol. I sometimes like the taste of a drink, but I never like the sensation. So that's, I don't have a lot of familiarity with this, but many people do, and I understand that. So let's say somebody enjoys a glass of wine or two with dinner and they eat dinner at 7pm. Is that likely to disrupt their sleep at all? Let's just sort of, let's make this a series of gradations. - And the answer is yes. I think once they just looked at a single glass of wine in the evening with dinner, and I would be untruthful if I didn't just simply say it has an effect. And we can measure that in terms of. - Less REM sleep. - Less REM sleep and one of the fascinating studies I can't remember what dose I think they got them close to a standard illegal blood alcohol level, so maybe they were a little bit tipsy. And yes, you see all of the changes that we just described, they sort of lose consciousness more quickly,

01:14:30 Growth Hormone & Testosterone

they have fragmented sleep, and they have a significant reduction in REM sleep. But what was also interesting because REM sleep, as we spoke about before, is a time when some hormonal systems are essentially recharged and refreshed growth hormone being one of them, there was well over a 50% five zero drop in their growth hormone release during alcohol laced sleep at night. - And growth hormone is so vital for metabolism and repair of tissues. - Yeah, it's not just for kids. - [Andrew] Keeping body fat low. - This is essential in adults. - It's essential, along those lines, I just want to highlight the fact that this information that you're sharing that growth hormone is released is strongly tethered to the presence of healthy amounts of REM sleep is interesting to me, because I always thought the growth hormone was released in the early part of the night. - Well, it is released across both of those, but across the different stages, but what we also know is that when you disrupt REM sleep, there are those growth hormone consequences. So it's not an exclusive system just like with testosterone, we can see changes throughout non REM sleep, but if you ask when are the peak release rates of testosterone, it's right before we go into REM sleep, and then during REM sleep. - And of course, testosterone being important, both for males and females. - For men and women, yeah. - Right, for libido and tissue repair and well being.

Nobody, regardless of chromosomal, hormonal, or any other background wants to have their normal levels of testosterone reduced acutely, that's just a bad it equates to a terrible set of psychological and physical symptoms. - Yeah, and the mortality risk that's associated with low testosterone

01:16:14 Emotions, Mental Health & Longevity

is non trivial. - Prostate cancer. - Right, exactly, you know. So coming back to just the point on REM sleep that you mentioned regarding emotional instability, and we see that that's one of the things one of the most reliable signatures of just insufficient sleep doesn't have to be sleep deprivation. What we've discovered over the past 20 years here at The Sleep Center, is that there is no major psychiatric disorder that we can find in which sleep is normal. And so I think that firstly told us there is a very intimate association between your emotional mental health and your sleep health. But when it also comes to REM sleep, I think what's fascinating is that it's not just about your emotional health, it's not just about your hormonal health we've also been seeing other aspects of you know, cognition. But then there was a report, I think it could have been about two years ago, out of Harvard, I think it was Beth Clements group. They found that, and they replicated it in two different large populations. If you look at the contribution of different sleep stages to your lifespan, REM sleep was the strongest predictor of your longevity. And it was a linear relationship. It wasn't it sort of one of these U shaped or J shaped curves that we often see with total sleep, and mortality risk, it really was linear. That the less and less REM sleep that you were getting the higher and higher your probability of death. And then they did. - Was that death due to natural causes or accident? 'Cause I can imagine if you're not getting enough REM sleep, you're more likely to drive off the freeway, step off a cliff. - I think it was all cause mortal. - You just make bad decisions about anything in love relationships, which can also be life threatening. - Yeah, I've tried to lean into that and claim that with those bad relationship situations, oh, I just didn't have enough REM sleep last night. - Blame it on the sleep. - [Matthew] My darling you know. - The REM sleep difference. - And, but she's far wiser than I thought. But, so they did this great machine learning analysis and I may get these numbers backwards. But I think for every 5% reduction in REM sleep, there was a 13% associated increased risk of mortality. And I could have, I'll have to go back and check. But to me, and in the machine learning algorithm, what they ultimately spat out was that

of all of the sleep stages, REM sleep is the most predictive of your longevity of your lifespan. So we often, I hear people saying, how can I get more deep sleep? Or they sometimes say how can I get more dream sleep? And my answer is a question. Why do you want to get more of that? And they'll say, well, isn't that the good stuff? And I'll say, well, actually all stages have good sleep. - It's all the good stuff. Well, it's like the exercise question and it took decades, for people to understand that moving around for about 150, probably 180 minutes a week at doing endurance type work, zone two cardio type work, it is correlated with living longer, feeling better, less diabetes, etcetera. There's really no way around it. I mean, you can ingest Metformin until the cows come home, you can take NMN, all of which I think have their place in certain contexts I'm a big fan of the work surrounding all those protocols. - Yeah likewise. - But without getting proper amounts of movement, meaning sufficient numbers, it doesn't matter how many 12 minute exercise regimes you follow per week, you need that threshold level. And it sounds like the same is true of REM sleep and total amount of sleep. There's just you pay the piper somehow. - Yeah, the return on investment I mean, to flip the coin, the return on investment is astronomical, you know, I think of sleep it is the tide that moves, you know, that raises all of those health boats. - And the most fundamental layer of mental and physical health. Whenever people ask me, even though I'm not a physician, they'll ask me, you know, what should I take or what should I do? The first question is always, how's your sleep? - Great, I love it. - Meaning how well do you sleep every night and how long do you sleep? And I always recommend your book, I always recommend your podcast, you know, the podcasts you've been a guest on, etcetera. Who knows, maybe you'll even release your own podcast

01:20:40 Books vs. Podcasts

at some point soon and keep because I do think people need to hear from you more often. One thing I don't want to return to the notion of public health discourse too much. But I do want to say one issue with books in general, is that they can be revised, but it's more or less a one and done kind of thing until the next book comes out. - Yeah, yeah - One thing I like about the podcast format is that updates can be provided regularly. Corrections and updates as new data come out. And so that's a wonderful aspect to this format. And hopefully the format that you'll be embracing, I think the world needs to hear more from you

01:21:20 Lunchtime Alcohol

more often, about sleep, and its various contours, not less. And so I do have a question about drinking alcohol. Not that we want to promote day drinking, but let's say that the one or two glasses of wine or cocktail is consumed with lunch, something that isn't traditionally done nowadays, or in a late afternoon happy hour type cocktail. And then one is going to sleep seven or eight hours later, do you think that that will improve or somehow mitigate the effects of alcohol? Or if you have a drink, are you are you basically screwed for the next 24 hours? - No, I think there's going to be a time window dependency. Now, I don't know of anyone who has essentially done what you and I would like, which is the time separation dose dependent curve, where okay, you drink at 10am, then or 11, 12 one, two, three, four, five all the way up to you know, 10pm and estimate, what is the blast radius? And is it linear? Or is it nonlinear? Is it such that only when you drink in the last four hours? Do you just hit this exponential and it's bad, bad bad? Or is there some other curve that we could imagine there will be many possibilities. But certainly what we know is that the less alcohol and the less and more specifically the metabolic byproducts, aldehydes and ketones, they're the sort of the nefarious players. - And not the ketones that people are all excited about the other ketones, [cross talking] the chemists know what we're referring to. - But this is not about ketogenesis, please don't think that. - This is not about ketogenesis, there are ketone bodies, and that are released after ingesting alcohol that are not of the positive sort that a ketogenic diet might promote. - Right, so I think in terms of that alcohol profile, we certainly know that, you know, as you're heading into the evening hours, once again, timing and dose make the poison. But I think it's also important, once again, from that public message standpoint, and thank you, I think I am leaning into the sort of the podcast consideration arena, at some point, but I don't want to be puritanical here, you know, I'm just a scientist, and I'm not here to tell anyone how to live. All I'm trying to do is empower people with some of the scientific literature regarding sleep. And then you can make whatever informed choices that you want. Now, unlike you, it turns out, I'm not a big drinker. It's just because I've never liked the taste. And I'm surprised that they haven't taken away my British passport because I don't like lager or beer. But I also want to say that life is to be lived to a certain degree, it's all about checks and balances. So, you know, if I go out and you know, I have an ice cream sundae, I'm not big on those either,

but, you know, sure, I know that my you know, blood glucose is not going to be ideal for another 12 hours maybe. That's just the price you pay for having some kind of relaxed, fun life. I don't want to look back on life and think, gosh, you know, I lived until I was, you know, 111 and it was utterly miserable you know. - Right. - So, but it's all about some kind of a balance. And my job is not to tell people a prescription for life, it's just to offer some scientific information. - No, I think you're doing a terrific job of that. People are I always say we have all these neural circuits and if it's working properly, we all have a circuit that allows us to skip over information or as we wish, right,

01:25:00 Marijuana/CBD

if the circuits between your brain and your thumbs are working you can slide right along you can drop to the next content however you like. I would like to ask about marijuana and CBD. This is a discussion that I think five years ago would have ventured into the realm of illegal but now in many places not all medical marijuana is approved or is legal. And certainly it's in widespread use. Certainly not recommending people do it. I have my own thoughts about marijuana CBD. I've been fortunate, I suppose that I don't particularly like marijuana or CBD. I don't even know if I've ever tried CBD. First of all, does marijuana disrupt the depth of sleep, the architecture of sleep? And if so, as with alcohol and caffeine does when you ingest it or when it's in your bloodstream does, relative to when you go to sleep, does that play an important role? So does marijuana disrupt sleep? - Yeah, it does. And there's a pretty good amount of data on so we can break sort of cannabis down into two of its key ingredients. We've got THC tetrahydrocannabinol, and we've got CBD and CBD is sort of the less psychotic what we think of as the non psychoactive components. In other words, when you take CBD, you don't get high. If you take THC, you can get high. That's the psychoactive part of the equation. - Are both considered sedatives in the technical sense? - No, they're not. Neither of them have that class right now. THC can, seems to speed up the time with which you fall asleep. But again, if you look at the electrical brainwave signature of you're falling asleep with and without that THC, it's not going to be an ideal fit. So you could argue it's non natural, but many people use THC for that fact, because they find it difficult to fall asleep. And it can speed the onset of at least non consciousness, I guess is the best way of describing it. But there are problems with THC. And they are twofold. The first is that it too, but through different mechanisms seems to block REM sleep. And

that's why a lot of people when they're using will tell me look, you know, I definitely, I was dreaming. Or I don't remember, you know many of my dreams. And then when they stop using THC, let's say I was having, you know, just crazy, crazy dreams and the reason is because there is a rebound mechanism. REM sleep is very clever. And alcohol is the same way in this sense, it's the same homeostatic mechanism. Some people will tell me, look, if I have a bit of a wild Friday night with some alcohol, you know, maybe I'll sleep late into the next morning. And I'll just have these really intense dreams. So and I thought I wasn't having any REM sleep, well, the way it works is that it's during in the middle of the night, really, when alcohol blocks your REM sleep. And your brain is smart it understands how much REM sleep you should have had, how much REM sleep you have not because the alcohol has been in the system. And finally, in those early morning hours, when you're getting through to sort of, you know, [cross talking] six, seven, 8:00am all of a sudden, your brain not only goes back to having the same amount of REM it would have had, it does that plus it tries to get back all of the REM sleep that it's lost. Does it get back all of the REM sleep? No, it doesn't. It never gets back all of the REM sleep, but it tries. And so you have these really intense periods of REM sleep. Hence you have really intense bizarre dreams. And that's what happens also with THC, you build up this pressure for REM sleep, this debt for REM sleep, will you ever pay it back? Doesn't seem as though you get back everything that you lost, but will you get back some of it? Yes, the brain will start to devour more because it's been starved of REM sleep for so long. But one of the bigger problems with THC that we worry about is withdrawal dependency. So as you start to use THC for sleep, there can be a dependency tolerance. So you start to need more to get the same sleep benefit. And when you stop using, you usually get a very severe rebound insomnia. And in fact, it's so potent that it's typically part of the clinical withdrawal profile from THC from cannabis. - And there's anxiety withdrawal. I you know, I don't ask anybody to change their behavior, we just as you said, we try and inform people about what the science says and let them make choices for themselves. People who are regular pot smokers, if you many of will insist they're not addicted, and maybe indeed they don't actually follow the profile of classical addiction, I don't know. I'm guessing some do, some don't. But if you ask them well, what if I took away all marijuana consumption for, I don't know, two weeks? That thought scares many of them. And many of them will experience intense anxiety without marijuana, which speaks to perhaps not addiction, but a certain kind of dependency. And again, you know, I know many pot smokers, some of whom have jobs that are quite high

performing and they manage. - Here in Berkeley, I don't know any of those. - Yeah, none of those, right. What about CBD? I mean, we hear so much about CBD, I've been a little concerned about the fact that the analysis of a lot of CBD supplements out there has confirmed that much like with melatonin, the levels that are reported on the labels, in no way shape, or form, match the levels that are actually contained in the various supplements. Sometimes the levels are much higher than they're reported on the labels. Other times, it's much lower. What does ingesting CBD do to the architecture and quality of sleep? - Right now, I don't think we have enough data to make some kind of, you know, meaningful sense out of it. I think the picture that is emerging, however, is probably the following. Firstly, CBD does not seem to be detrimental in the same ways that THC is. So we can start by saying does it create you know, potential problems, not of the nature necessarily that we see with THC. But the devil is a little bit in the details from the data that we do have and it comes on to your valid point of purity. At low dose, CBD can seem to be wake promoting. So in lower doses, let's see sort of five or 10 milligrams and trying to remember some of the studies off the top of my head, there it actually may enhance wakefulness and cause problems with sleep. It's only once you get into the higher dose range, that there seem to have been some, you know, increases sorry, increases in sleepiness, or sort of sedation like, increases. And that's usually I think, above about 25 milligrams, as best I can recall from the data. And then when we look in animal models, you typically see the same type of profile too. So then the question becomes and now again, you just don't know about, you know, purity. It's very difficult, although I think, and again, I'm not a user, not necessarily because I you know, have anything against it. It's just that's not, you know, necessarily my cup of tea. There are some firms that are now doing third party independent laboratory tests. I don't know how gamed that is, so I've got no sense of it. - I think some supplement companies are quite honest and accurate about the amounts of various substances that are in their products and some are not. And I think there's just a huge range. I think the FDA is starting to explore CBD there I certainly I saw some grant announcements to explore the function of CBD. Most of the work on CBD is being done by the general public adjusting it and seeing how they feel. I gave it to my dog who was had some dementia related sleep disturbances, and it actually created a heightened wakefulness it completely screwed up his sleep. - Okay, it sounds as though it just wasn't. - He's a bulldog. So if he's going to get access to sleep, he's going to take it. - Okay. - Really messed him up, took him took it away, he did better. But you know, that's a canine, so. - Right, and it

could have been, you know, sort of dose related too. - Or binders or other things that are in there, sure. - Correct, yeah and we, but right now, if we were to, and I'm not making the statement, I don't think anyone can make the statement now. But if it ends up being that CBD is potentially beneficial for sleep, how can we reconcile that mechanistically? And I think there are, to me, at least, there are at least three candidate mechanisms that I've been exploring and thinking about. The first is that it's thermo regulatory. And what we found in some animal models is that CBD will create a profile of hypothermia. In other words, it cools the body the core body temperature down. And that's something that we know is good for sleep. The second is that it's an anxiolytic, that it can reduce anxiety. And that data is actually quite strong, even with some functional imaging work that's been coming out recently showing that one epicenter of emotion called the amygdala deep within the brain is quietened down with CBD. So I think that's at least a second non mutually exclusive. - That's great, that's conducive. - You know, possibility. I think the third is some recent data that's come out that was suggesting that CBD can alter the signaling of adenosine. So it doesn't necessarily mean that you produce more adenosine, but what it can do is perhaps modulate the sensitivity perhaps of the brain, so that the weight of that same adenosine is weightier in its brain signal, and therefore it creates this stronger pressure for sleep. So I think these are all tentative mechanisms. I think any one of them is viable, I think all three are viable together. But right now I think, does that sort of help think through the tapestry of THC and CBD? - Yeah very much so and actually, it's a perfect segue from we've talked about caffeine, alcohol, THC and CBD as sort of, we framed them anyway, as things that done in moderation at the appropriate times, are probably okay for most people. Certainly not for everybody, there will be differences in sensitivity. But that done at the incorrect times, and certainly in the incorrect amounts will greatly disrupt this vital stage of life we call sleep. CBD, it seems, represents a kind of bridge to the topic I'd like to talk about next,

01:36:00 Melatonin

which is things that promotes more healthy sleep, or somehow contribute to enhancing the architecture and quality of sleep. So I'd love to chat for a moment about the kind of grand, the original I should say that not the granddaddy but the OG of sleep supplementation, which is melatonin. The so called hormone of darkness that's inhibited by light, etcetera. Frame for us, melatonin in the context of its naturally occurring form.

And then I'd like to talk about melatonin the supplement because in my experience, anytime I say the word melatonin, people think about the supplement melatonin, which in itself is an interesting phenomenon that people are so cued to its role as something you take, we often forget that this is something that we make endogenously. I'd love for you to comment in particular on even though without necessarily getting into its precise nanograms per deciliter values, what are the typical amounts of melatonin that we release each night? And then I'd like to compare that to what is contained in say a three milligram or six milligram tablet that one might buy at the pharmacy. - Right, yeah. - So I go to sleep at night, has melatonin already kicked in before I shut my eyes and lay down my head? - Usually, yes, if your system is working in the correct way, as dusk is starting to happen, so let's say that you look at hunter gatherer tribes who aren't touched by electricity, and so that's sort of the puritanical state par excellence when it comes to electric light influence. And usually, it's as dusk is approaching, that's when melatonin will start to rise. And so when you lose the brake pedal of light coming through the eyes, that normally acts like a hard brake pedal that stamps down and prevents the release and production of melatonin. As that light brake pedal starts to fade with dusk, then we ease off the brake pedal and melatonin the spigot of melatonin is opened up, and melatonin starts getting released. And usually we'll see this rising peak of melatonin sometime, usually an hour, two hours later or around and it varies from different people around the time of sleep itself. But it's already been on the march for some hours before you actually hit sleep itself. - Interesting, and I was always taught and I'm assuming it's still true that the only source of melatonin in the brain and body is the pineal gland. Is that still true? - Yeah, it seems to be from best that we can tell the pineal gland sort of meaning pea like sort of shape. It's actually I think usually people say it's pea like, I think if you look at the Latin derivative, it's more, I think it's derived from pine cone, not pea because in fact, if you look at the pineal, it is more pine cone shaped and so is aptly named. - Any human brain I've ever dissected or I confess I've dissected a lot 'cause I teach neuroanatomy and have for years. I love looking at the pineal it's the one structure in the brain that's not on both sides. It's usually pretty easy to find. And it's a pretty good size. It looks like a, it looks like a pea. And it's sitting right there. And it's remarkable that it releases this hormone. Sort of probably our entire lifespan is inhibited by light. So our pineal starts to release this into the general circulation. I have to imagine we have melatonin receptors in the brain and body. - It's correct, so yep, essentially, your brain has a central Master 24 hour clock called the super charismatic nucleus that keeps

internal time. Now it's not a precise clock if left to its own devices, nothing that a Swiss clock maker would be proud of. It runs a little bit long and laggy. - It's like an American clock. There are a couple of good American watches by the way, Hamilton's are very nice, but. - It's very much like a bug. - We're not famous for our timekeeping or our punctuality for that matter, but the Swiss are. - It's very it's not quite Swiss, like it's more Berkeley like, which is very relaxed. Oh you know what whatever. So in most adults, the average adult, I should say, your biological clock normally runs a little bit long, it's about 24 hours and 30 minutes, I think was the last calculation. But the reason that we don't keep drifting forward in time and kind of running consistently, you know, more and later and later, 30 minutes by 30 minutes by 30 minutes each day, is because your central brain clock is regulated by external things such as daylight and temperature, as well as food and activity. All of these are essentially different fingers that come along and on the wristwatch of the 24 hour clock will pull the dial out and reset it each day to precisely 24 hours. And I make that point because it knows 24 hour time, but it needs to tell the rest of the brain and the body, the 24 hour time as well. And one of the ways that it does this is by communicating a chemical signal of 24 hour nurse of light and day using this hormone, melatonin. And when it is at low levels, or it's non existent, it's communicating the message it's daytime, and for us diurnal species, it says it's time to be awake. Yet, at nighttime, when dusk approaches and the break comes off melatonin and we start to release it, then it signals to the rest of the brain and the body, look, it's dusk and it's nighttime. And for us diurnal species, it's time to think about sleep. So melatonin essentially tells the brain and the body when it's day and when it's night, and with that when it's time to sleep when it's time to wake. And therefore, that's why melatonin helps with the timing of the onset of sleep. But it doesn't really help with the generation of sleep itself. And this is why we'll come on to what those studies of supplementation have taught us. - So it tells the rest of my brain and body, it's time to go to sleep. It perhaps even aids with the transition to sleep but it's not going to for instance, ensure the overall structure of sleep or it's not the conductor that's guiding the sleep orchestra so to speak throughout the entire night. - Yeah, it's. - It's more like the people that essentially take you to your seat and sit you down and give you your program. - Right, exactly yeah, sort of the the fall, less sophisticated analogy I have is, you know, melatonin is like the starting official at the 100 meter race in the Olympics. - That's a better analogy, yeah. - It calls all of the sleep racers to the line and it begins the great sleep race. - Yeah, better analogy by the way. - [Matthew] It doesn't help dissipate, no, no, no, no. - Coming from

the sleep researcher of all people. - But it doesn't participate in the race itself. That's a whole different set of brain chemicals and brain regions. Which then brings us on to perhaps the question of supplementation, which is, is it helpful for my sleep? Will I sleep longer? Will I sleep better? And if I am, what dosage should I be taking? Sadly, the evidence in healthy adults who are not older age suggests that melatonin is not really particularly helpful as a sleep aid. I think there's a recent meta analysis that demonstrated when it looked at all of the different sleep parameters, melatonin, and a meta analysis for those not knowing what that is, it's a scientific sort of method that we use where we gather all the individual studies and we put them in a big bucket and we kind of do this kind of statistical fancy sleight of hand. And we try to come up with a big picture of what all of those individuals studies tell us. And what that meta analysis told us is that melatonin will only increase total amount of sleep by 3.9 minutes, on average. - Minutes? - [Matthew] Minutes. - Not even percent. - And it will only increase your sleep efficiency by 2.2%. So it really. - This is as they say, in certain parts of California, that's weak sauce, that's a weak sauce effect. - The sauce is not strong, the force is not strong in this one, when it comes to a tool that in healthy people who are not of older age, it doesn't seem to be especially beneficial. Now, you know, results can vary. Everyone is different, of course. So we're talking about the average, the so called average human adult here. - Well, melatonin, in defense of what you're saying and also I should mention, I have a colleague at Stanford, Jamie Seitzer. - Oh, wonderful, genius. - Chuck Seitzer's lab at Harvard Med where he also trained terrific sleep researcher and I asked him about melatonin and he essentially said the same thing that you just said which is very little if any evidence that it can improve sleep and yet it's probably the most commonly consumed so called sleep aid. - Hundreds of million dollars industry. - Yeah, so either massive placebo effect or it's operating through some other mechanism related to quelling anxiety perhaps? - Well, yeah, that's essentially interesting, you know, there are some studies where you do see some, you know, effects. Now, again, when you do the grand average of all studies, it just doesn't seem to have an effect. But let's assume that for some people, it does have an effect let's not again be sort of completely dismissive of that, how could it have that effect? One of the reasons that I've become a little bit more bullish on melatonin from a sleep perspective and then melatonin more generally for a, maybe you can speak about this too, as a counter measure when you're undergoing insufficient sleep. There are two different routes there. The first reason that I think it could have a sleep benefit for some people is not because it helps in the generation of

sleep, we know that it doesn't, it's because it too seems to drop core body temperature. - There it is, temperature again. I'm fascinated these days, more and more by temperature, as maybe not just a reflection of brain state and wakefulness and in sleep, but actually a lever that is quite powerful. - I think it's both. - And with all the interest in ice baths and hot showers and saunas and stuff, something that we will definitely touch on. Temperature variation is so key. So if melatonin is dropping body temperature by a degree or so something that you've said before can help induce a sleepy state. Maybe that's what's allowing people to get in to sleep. - I think that's one possibility. I don't think melatonin by itself will drop it by it sort of, you know, a degree, certainly not a degree Celsius. And for order in us to fall asleep, and then stay asleep across the night, we do need to drop our core body temperature by about one degree Celsius, or about two to three degrees Fahrenheit. And that's why it's always easier to fall asleep in a room that's too cold than too hot. I think that that's one potential avenue that we are considering thinking more deeply about when it comes to melatonin. And then the other is melatonin as an antioxidant. But let me table that for now. 'Cause I'll just get us sidetracked. That's what we know so far about melatonin in terms of its supplementation benefit or lack thereof. Two final points that I shouldn't forget, one is the only population where we typically see some benefit, and it often is prescribed is in older adults, because as we. - Older meaning 60 and older? - Yeah, 60, 65 and older because as we get older, you can typically have what's called calcification of the pineal gland. Which means that that gland that's releasing melatonin doesn't work as well anymore. As a consequence, they tend to have a flatter overall curve of melatonin release throughout the night. It's not this beautiful, lovely peak, and this bullhorn message of its darkness, please get to sleep. That's why older adults can have problems falling asleep or staying asleep. It's not the only reason by any stretch of the imagination. But it's one of the reasons and it's why melatonin supplementation in those cohorts, older adults, and especially older adults with insomnia, people have thought about that as maybe an appropriate use case. - Well, along those lines, if we were to compare dosages, I don't, do we know how much melatonin is typically released into the bloodstream per night? And can we use that as a kind of a rule of thumb by which to compare the typical amount that someone would supplement? Typically, the supplements for melatonin that I see in the pharmacy and elsewhere online range anywhere from one milligram to 12, or even 20 milligrams. My guess is that a normal night's release of melatonin typical for somebody in their 20s, 30s, 40s would be far lower than that, am I correct or wrong? - Yeah, it's many magnitudes

lower. And this is one of the problems is that I see that too. I see, you know, typical doses are, you know, five milligrams or 10 milligrams and of course, you know, if you're a supplement company, you know, putting 10 milligrams versus five milligrams, if that's what you're actually doing, which we'll speak about purity as well. You know, it's kind of like the super gulp size, nobody wants to lower price, they just want you to you know, we'll just give you more for the same price. And that's how we'll compete. So it's been this escalating arms race of melatonin concentration, and it really does not look meaningful for, you know, for sleep in any way. What we've actually found is that the optimal doses for where you do get sleep benefits in the populations that we've looked at, are somewhere between 0.1 and 0.3 milligrams of melatonin. In other words, the typical doses are usually 10 times, 20 times maybe more than what your body would naturally expect. And this is what we call a supra physiological dose. In other words, it's far above what is physiologically normal? You know, and to put that in context, imagine I said to you, I want you to eat 20 times as much food today. - I thought you're going to use testosterone as example. You're going to take 300 times the normal amount of testosterone we know that would have tons of deleterious effects it would be terrible. And yet you can do this. One thing that I'm concerned about about these super physiological levels of melatonin is that many years ago, actually, here at Berkeley, when I was a graduate student, we would inject animals which were seasonally breeding animals with melatonin. And the consequence of that was that their gonads, either their testes or ovaries would shrink, many hundred fold or more. In other words, they would go from having nice healthy sized hamster testicles, what a hamster would consider healthy size for a hamster and they would shrink to the size of a grain of rice. So from like an almonds to a grain size of a grain of rice. I had to see that only once for me to be very concerned about super physiological levels of melatonin. And I realized that melatonin does different things in different species. We are not hamsters, we are not seasonal breeders seasonally restricted breeders, there might be more breeding during certain seasons, I don't know those data. But nonetheless, hormones are powerful. And sure there is an optimal, and sometimes we see that going slightly above endogenous levels for certain hormones not always, can have beneficial effects. And sometimes it can have detrimental effects. I'm just concerned about taking high levels of a hormone that has effects on the reproductive axis and that's one of the reasons why I get very concerned when I see people really getting aggressive about melatonin supplementation taking 100, 10, 500, sometimes even 10,000 times the amount that we would normally

release. That's my concern, although it's not nested in any one specific human study. I just don't like to see, I certainly don't want to see other people and I don't want to personally take a hormone that's known to be androgen suppressive at high levels. Why would I take that? That's the question I ask myself. - I think it's a very, you know, good point. And if you look at some of the evidence around, you know, melatonin's lethality if you want to go to that extreme, for the most part, you know, it's pretty safe. - You mean, you can take a lot of it before you die? - Right, exactly yeah. - But I don't know that that's the criteria. - That should be your yardstick for, because, you know, you really need to think about your, you know, your health, not just whether this thing is going to kill you or not as the decision matrix through which you pop a pill. And it comes on to this concern around melatonin because there was a study, I think it's one that you mentioned too where they looked at over, I think it was at least over 20 different brands of melatonin supplements. And what they found is that based on what it said, on the bottle versus what was in the capsules themselves, it ranged from, I think it was 83% less than what it said on the bottle to 478% more than what it said on the bottle. Now, if that's a 10 milligram, you know, pill, and it's 478% more than 10 milligrams, and we're already at 10 milligrams at many tens of times more than is a physiological rather than a supra physiological dose, we do need to be a bit thoughtful. - Yeah, remember those hamsters folks. Well, and I do appreciate the deep dive on melatonin because I think people need to understand that it's nuanced, it's a matter of dosages, and timing, etcetera. And then it may have its place as you mentioned in older individuals. And I should mention that I'm an avid consumer of supplements that I believe in for me and I have been for a very long time. So I'm by no means anti supplement. Some supplements I refuse to take or avoid taking

01:54:14 Magnesium

others I quite avidly take and along those lines, I personally and I don't know what your thoughts on this are. But there are a few things that I've personally found beneficial. I love your thoughts on them. And I would love it if you would tell me that everything I'm about to refer to is placebo, that would be fine. So that's what we do, we're scientists we argue and then we remain friends in as it goes away. So magnesium, there are many forms of magnesium. Magnesium citrate is as we know, is a terrific laxative. Magnesium malate seems, at least from a few studies seems to relieve some of delayed

onset muscle soreness doesn't seem to create a kind of sedation. Two forms of magnesium that I'm aware of magnesium biglycinate and magnesium threonate. We believe based on the data can more actively cross the blood brain barrier. So you put in your gut, but some of that needs to go into your brain in order to have the sedative effect. What are your thoughts on magnesium supplementation? Do you supplement with magnesium? And what studies would you like to see done if they haven't been done already. - So I don't supplement with magnesium. But I do think threonate is interesting because of that higher capacity to cross the blood brain barrier and actually have a central nervous system effect. And the reason that that interests me is because the sleep is by the brain of the brain, and also for the brain, as well as for the body. We just don't have a particularly good set of studies that have targeted exclusively threonate. We do have lots of studies that have just looked at magnesium in general for sleep. And overall, the data is unconvincing. - Interesting. - And for a while, I was confused as to why, where did this come from this kind of myth of magnesium? So I started looking back into the literature and I've best traced it at least as far as I can tell, to early studies showing that those who are deficient in magnesium also had sleep problems. They had other problems too, of course, but sleep problems were one of that set of sequelae that came from having lower magnesium. And when they supplemented with magnesium and tried to restore those levels, some of those sleep problems dissipated. And then that seems to have gotten lost in sort of some game of sort of like whispers around the room and it's become translated into people who don't have sleep problems, who are healthy sleepers, and who are healthy in general, and who have healthy normal levels of magnesium, if they take more magnesium, they will sleep better. And the data really, there is not good. Once again, the only study that I've seen where magnesium did have some efficacy was in a study with older adults, I think they were 60 to 80 years old, it may have been exclusively women, now I think about it and they also had insomnia. And in that population, you did see some benefits. And my guess is that because it's an older community as well, they were probably deficient in magnesium. So they fit the former category of simply when you're deficient, and you restore, you can help sleep sort of return to normal. But if you are not deficient and you're healthy, and you're not old and you don't have insomnia, and you're supplementing thinking that it provides sleep, right now, the data isn't supportive of that. But I just don't think we have enough threonate data to actually speak about that, because it could just be a blood brain barrier issue so far with the other forms. - So maybe some additional studies looking specifically at

threonate or bi-glycinate would be useful. - I'd love to have. - Magnesium is involved in so many cellular processes, you can imagine that this effect, if it truly exists is, as we say, in science in the noise, meaning it's in the jitter of the data, but to isolate the real effect

01:58:10 Valerian, Kiwi, Tart Cherry, Apigenin

one needs to do some more refined studies. What are some things that are of interest to you, if not things that you happen to take? These are not things that I personally take mostly because I just haven't experimented with them. valerian root is one, tart cherry and kiwi fruit. Tell me about Valerian root, tart cherry and kiwi fruit. This is new to me. I have certainly heard of them. And tart cherry and Kiwi sounds delicious, but what's happening with Valerian root tart cherry and kiwi and are we talking about eating tart cherries and Kiwis and Valerian roots? - Yes. - Or are talking about taking them in pill form? - Usually it's supplements, but it's also both for tart cherries and for kiwis. It's the actual, you know, fruit themselves. Valerian often touted as a beneficial sleep aid and lots of people swear by it too. But the evidence is actually quite against that. - Oh really? - Not that it makes your sleep worse, but of at least the seven good studies that I've been able to find, and typically these are of the nature of what we call a randomized placebo crossover design. And I won't bore people with what that means it's sort of one of the. - Good studies, solid studies. - Yeah, it's one of the sort of gold standard methods that we have when we're looking at intervention studies such as drugs studies. Five of the seven found no benefits of Valerian root on sleep. Then two out of the seven, the data was just insufficient. I think it was a power issue where they just couldn't make any strong conclusions. And then I think there was the most recent study, I think looked at two different doses of Valerian and I could have this wrong and they just failed to find any effects once again, but the stunning part of that paper, as I recall, they had this big table with all of the different sleep metrics that they looked at. And there were well over 25 different things that they tried to see if valerian impacted. And none of them were significant. Which stuns me because from statistical probabilities, we know, if you just randomly perform 25 statistical tests, chances are probabilistically, you'll just get one significant result by random chance. And even with random chance on their side, they still couldn't find a benefit of Valerian, so. - So Valerian root might be worse than nothing at all, if there is, so to speak. - I mean, again, placebo effect we can think about that too.

And I would say that if you feel as though it's having a benefit for you, and with all of the caveats that we have with supplements, things like melatonin purity, concentration, et cetera, you know, maybe it's no harm no foul. But I'm not a you know, a medical doctor and I don't tell anyone about we have all of these disclaimers about not recommending such things. - And we'll include these, I mean, I always say, you know, we're not physicians, we don't prescribe anything. We're scientists and professors so we profess things. It's up to people to be responsible for their own health. Not just to protect us but to protect themselves. I do want to hear about tart cherry and kiwi fruit. What's the story there? - Strange, isn't it? I was, you know, I'm kind of a hard nosed scientist, and when people you know, some years ago started saying, oh, tart cherries, it's the thing or kiwi fruits, I was thinking, oh, my goodness, the sounds a bit. - You've been in California a little too long. - Yeah, I know, yeah, the sun is softened me some. But I thought, look one of the things that we have to do as scientists is be as open minded as possible. And I should not be so quick to dismiss. So I went to the literature just started reading as much as I could about it. And there were three really good randomized placebo crossover trials with tart cherries. And what they found was that in one study, it reduced the amount of time that you spent awake at night by over an hour. And then the other two studies, one of them found that it increased the amount of sleep that you've got by 34 minutes. The other it increased the amount of sleep that you got by 84 minutes. Which you know, these are, and what's striking is that they were independent studies, I think, meaning that they were from independent groups, and these were, you know, some of these guys, you know, and girl, I know pretty well, and they are really. - You know and trust their work. - Right, I really trust their work too. - Were they ingesting actual tart cherries or they're drinking the juice or in capsule form? - It was juice. So they in all three studies, it was juice. Although you can I think as a supplement, you can buy it in a capsule, and we've got no idea whether that changes the benefit or not. What was also interesting in I think it was that last study where they got an increase in sleep by 84 minutes, it also decreased a daytime napping significantly. - That's one that I could certainly make use of. I love my day time naps, but I'd love to skip them too. - Right and we can speak about naps and sort of the upside and downside of that. Which then made me think well, if that's the case, may be the net net benefit on sleep overall, is no different. It's just that it decreases the amount of time that some people were taking to sleep during the day, and giving it back to the night. But that wasn't the case, 'cause if you added the total amount of sleep that they were getting without tart cherries, both naps and nightly sleep

combined, still, when you took tart cherries, you still got a net some benefit, of total amount of sleep. So you know, so far, when it comes to supplements, and those types of studies, they're good studies, and the data looks interesting. But as a drug itself, you know, if this was clinical drug, you know, three studies that are somewhat small in nature and have some positive benefit that's what we would call preliminary data of maybe a chin scratching kind so keep this in context. - Yeah, and depending on the margins for safety, one might think, well, given that it's a tart cherry as opposed to some pharmaceutical you need a prescription for then, you know, some people their threshold to experiment with supplements is quite low, some people their threshold is quite high. I feel like you know, there are two categories, or at least two categories of folks out there. People who hear oh, tart cherry can improve sleep, and we'll run out and try it. And people who hear well, that sounds crazy. Why would I do that? But of course, we have to remind people that tart cherry isn't really what we're talking about, presumably if this is a real effect, and sounds like it might be that there's a compound in tart cherries. - That's right. - That if we were to call it, whatever, whatever five alpha six, you know, some molecule, if we refer to it by its technical name, then people would say, oh, that sounds like a very interesting technical way to approaches sleep but doesn't sound very natural. So both groups are a little bit misguided in the sense that people who think that everything that comes from naturally occurring foods, plants, etcetera, things that grow out of the ground, that that's all safe, that's not true. And people that think that pharmaceuticals are the if it's not evidence with the purified molecule, then something's not of utility. Well, that's certainly not true. somewhere in the middle, I think lies the answer, which is, it sounds to me like tart cherry is at least an intriguing potential sleep aid. Intriguing potential sleep aid and underscoring potential. I'm certainly intrigued by it to the point where I might experiment a bit, but I'm an experimenter for myself. Before I ask you about kiwi, I've had quite good results from taking something called apigenin, which is a derivative of chamomile. But in supplement form, I think I take 50 milligrams about 30 minutes before sleep. And I subjectively experience a better night's sleep, so to speak. I don't measure I confess, I don't measure my sleep. I'm not a sleep tracker guy. But, you know, there are a few papers out there they're not what we would call blue published in Blue Ribbon journals, but they have control groups, and it looks somewhat interesting. And there when I say apigenin people get somewhat intrigued oh this molecule. Chamomile has long been thought to be a sedative, a mild sedative, but a sedative? Do you drink chamomile tea? Do you take apigenin? What are your thoughts

on apigenin? - Yeah, I don't. And I have looked into some of the data regarding sleep as well. Right now from best I can tell it's mostly subjective data rather than objective hard sort of sleep measures. And that's why right now I you know, it's sort of unclear not no comment, but just unclear, not dismissing it, because I think you and I both ascribe to the idea of absence of evidence is not evidence of absence. So keep your mind open, at least I tell that to myself. I think if you're finding a benefit, and you can do what I would think of if I was personally experimenting, which is both the positive and negative parts of the experiment, what I mean by that is, you know, let's say that I now want to, you know, think about some kind of sleep supplement, I will take some kind of baseline set of recordings for a month, and I will just gauge where I'm at, sort of supplement free. Then I'll go on for a month or two, whatever I'm thinking of taking, and I don't, you know, supplement. But let's say that I want to and I experiment with that. And I feel as though based on my metrics be them objective from my aura ring or be them subjective from whatever I'm, you know, writing down in the morning, and both are important and valid, subjective and objective, we like both in the sleep world. And I think, okay, look, it's clearly that it seems to have some kind of an effect. The key thing, however, is then do the negative experiment, which is now come off it for another month, and see, do things get worse. And if I can see that by directionality, then I'm starting to think maybe I'm believing this a little bit more. So that's the way I would sort of typically approach you know, a supplementation regiment if I were to do it. And that's just me, that's just the way my mind works, but. - No, that's great. I think it's very scientific and organized in a way that allows you and would allow other people to make very informed decisions for themselves. I like that. I like to think in terms of manipulating any aspect of our biology, that behavioral tools always are the first line of entry, then nutrition, everyone has to eat sooner or later, even if you're fasting, then perhaps supplementation, then prescription drugs, and then perhaps brain machine interface, devices that you use to induce something. And those can be done in combination. But what concerns me is when I hear people say, well, what should I take without thinking about their behavior, their light viewing behavior, etcetera. But of course, these things work in combination. - And I think it's, you're right, that there's many when it comes to sleep, there are many low hanging fruits that don't necessarily require you to, you know, put sort of exogenous molecules in other words things like supplements into your body or, you know, use different types of drugs to help you get there. Now, when it comes to prescription sleep aids, I think I've been again a little bit too forthright. We know in clinical practice that there may be a time

and a place for things like sleeping pills, they are a short term solution to certain forms of insomnia, but they are not recommended for the long term. And we also know that there are lots of other ways that you can get a sleep help or you can get a sleep curative profile from things like cognitive behavioral therapy for insomnia, which is a non drug approach, psychological. - And quite effective from what I understand, good data. - Just as effective as sleeping pills, great data more effective in the long term. There's a recent study published that after working with a therapist, some of the benefits lasted almost a decade, you know, now, if you stop sleeping pills, usually you have rebound insomnia, where your sleep goes back to being just as bad if not worse. And I think the same is true, when we think about supplementation, there are so many things that are easy to implement when it comes to sleep, that don't require venturing out into those waters. And again, we're not here to tell anyone about whether they should venture or not, that's completely your choice. All I'm saying is that if you want to think about optimizing your sleep, there are a number of ways that you can do it that don't necessarily require you to swallow anything or inject anything or you know, smoking or anything, or free base. - And of which the margins of safety are quite quite wide. That's the other one. - Yes, right thank you. So speaking of low hanging fruit, I don't know how it hangs in reality, but what about kiwi? They're delicious to me anyway. - Yeah, the humble kiwi fruit named not shouldn't be mistaken for the flightless bird of New Zealand, which is the native bird there. We're talking about the kiwi the fruit here, which those trees and shrubs are mostly South East Asia. Kiwi fruits have been previously touted as potentially having a sleep benefit, which again got me curious and I at first threw it out. To my knowledge, there's really only one published human study that's of any value. But what they did find was that it decreased the speed of time with which it took you to fall asleep. - These are you ingesting the whole kiwi. So it's ingesting the whole kiwi. - With the skin, I eat the skin, people cringe when they see me, or don't eat the skin? - Well, I think, no, no, no, I think the idea is some of the good stuff and I'll come on to this may actually be in the skin itself. - Oh wonderful, thank you. You just helped me win a bet. I'll give you your cut. - Okay, okay, yeah, you can pay me later. By the way this skin is use? No, no, no. He just told me to say that's how he wins, no, he did not. So the skin seems to be part of this potential sleep equation. And that study, you fell asleep faster and you stayed asleep for longer and you spent less time awake throughout the night. And I just thought, well, you know, that's one study, what can you really do with that? There was another study, however, in an animal model, which is, you know, a little bit more interesting. And once

again, they found a very similar phenotype that the rats, sorry they were mice, the mice fell asleep faster. And they also spent longer time in sleep. The sleep duration also increased. What was also interesting mechanistically and this is not the mechanism that I think ties together tart cherries, kiwi fruit, and you know things like melatonin, because I think there could be one common binding mechanism. What they found in the animal study is that they could block those kiwifruit sleep benefits using a GABA blocking agent. Now GABA which stands for Gamma Amino Butyric Acid is one of the major inhibitory neurotransmitters of the brain. It's kind of like the red. - So a naturally occurring sedative, sort of? - Yeah, it's the kind of the red light on the traffic light signal, you know, others are green light. GABA is red light. So by playing around with some sort of clever drugs to manipulate the system, they could prevent the benefit of the kiwi fruit by sort of bugging around with the GABA receptor, meaning that perhaps part of the kiwi fruit benefit on sleep was mediated by the brain's natural inhibitory neurotransmitter system called the GABA system. - That's exciting. - And I thought that that was kind of, that convinced me a little bit more that maybe there's something here to read into. So to be determined, again, here is the banner, but you know, tart cherries and kiwi fruits the data surprised me, because in part I was so preoccupied with being you know, I don't know a bit pure-ish about and a bit snobby thinking come on, that's definitely not going to work, well the data certainly found out. [cross talking] - I look forward to a day when supplements are no longer called supplements, because at the end of the day, whether or not something has an effect, whether or not it's a whole kiwi fruit or a derivative of kiwi fruit will depend on the molecular compound. And as you mentioned, this potential mechanism via the GABA system, we both as scientists get excited about mechanism 'cause when you can trace a mechanism and a pathway it provides a rationale a grounding for why kiwi of all things or tart cherry of all things

02:15:00 Tryptophan & Serotonin

might help increase total sleep time. I'd be remiss if I didn't mention or ask about tryptophan and serotonin. I can anecdotally say, when I've taken tryptophan, the precursor to serotonin, or serotonin itself, I have a horrendous night's sleep. I fall asleep very easily. And I experience ridiculously vivid dreams. Neither pleasant nor unpleasant is kind of a mishmash. And then I wake up and I experience several days of insomnia. That and I've done the positive control and the negative control and all the variations

there of to confirm that, at least for me supplementing with serotonergic agents is a bad idea for me. And tryptophan is a common sleep supplement and sleep aid that's discussed. The normal architecture of sleep involves the release of serotonin, but in a very timed and regulated way. What are your thoughts about serotonin in sleep? If you had to kind of put that into a nutshell. And then why supplementing with serotonin and or its precursor, tryptophan might be a good or a bad idea for somebody. - I think one of the potential dangers is that based on what's going on in your body, that can change the absorption of natural sort of tryptophan and serotonin uptake within the brain itself. So I'm always thoughtful when you're playing around with that mother nature dynamic as it were. The data as you described is a little bit all over the map. Some people say that it knocks them out other people say just like you do, it has a terrible impact on my sleep. And when I stop, it's pretty bad for a couple of days, it seems to have this lingering after effect. I think what could be happening here is we need serotonin to just as you described, to be modulated in very specific ways during the different stages of sleep. If you look at the firing of the brain epicenters where serotonin is released, and there's a bunch of them in the brainstem, what you find, and the release of serotonin too, when we're awake, it's usually in high concentrations, as we start to drift off to sleep, it lowers some, but not necessarily dramatically as we're going into non REM sleep. But then when we go into REM sleep serotonin is shut off. The other, one of the other neuromodulators noradrenalin also shut off. REM sleep is the only time during the 24 hour period, where we see noradrenaline and serotonin or norepinephrine, completely shut down. When I say serotonin, we're also talking 5-HTP, sorry, 5-HT, that's just its chemical name here. So whether it was speaking about serotonin or 5-HT is the same thing. Norepinephrine, noradrenaline, both of those need to be shut down for you to produce REM sleep. The other, one of the other neuromodulators, that then ramps up to produce REM sleep is acetylcholine. So these three neuromodulators have this incredible reciprocal dance that they have for you to generate what is called a natural architecture of sleep throughout the night. - It's the push pull again. - It's a push pull again, you know, it's you know, it's just and back. It's, you know, whatever you want to think of. That's why I think if you're trying to increase dramatically drive up your serotonin levels at night, and that sustains throughout the night, when you're trying to get into REM sleep, you could be artificially fragmenting REM sleep. Now, I don't know the data, I don't think anyone's really got the data. - No, I haven been able to find it. - But that's why I would be, you know if you were to say, Matt, two years time, that's the data helped me

understand the potential mechanism or let's design some experiments, where would you go first? I would say let's look at the disruption of REM sleep, non REM sleep, reciprocal regulation, because, you know, you need serotonin to be, you know, up at one time down at another, so. - I agree with everything you said. And I'm personally never taking tryptophan or serotonin again,

02:19:24 Naps & Non-Sleep-Deep-Rest (NSDR)

unless there's some clinical reason for that that I would need to do that. I want to ask about some other pro sleep behaviors. But before I do that, let's talk about naps. I love naps. I come from a long history of nappers. My dad always took a nap in the afternoon, I take a 20 or 30 minute nap or I do a practice which I took the liberty of coining NSDR, non sleep deep rest, some sort of just passive laying out their feet up elevated. Sometimes people do you or I'll do yoga Nidra, I'll do hypnosis or something of that sort, but 20 or 30 minutes of that has been very beneficial for me to get up from that nap or period of minimal wakefulness, we'll call it and go about my day quite well, and also fall asleep just fine. What are the data on naps? Do you nap? And what are your thoughts about keeping naps short meaning 20 to 30 minutes versus getting out past 90 minutes, two hours? So for you personally naps, yay, nay or meh? - I don't nap. And I've just never been a habitual napper. - Is that because you don't feel sleepy in the afternoon, or because? - I typically don't feel sleepy? - So you're just hardier then. - I am, I wouldn't say hardier, I may be less capable of falling asleep, my sleep drive. - But you're not dragging through the afternoon? - No, no, I don't drag through out the. - So you don't nap because you don't feel a need to nap? - That's right, yep. Now, it's not that I am immune to what we call the postprandial dip in alertness. I definitely feel as though there can be this kind of afternoon lull, where, you know, I'm not quite as on as I was at 11 o'clock in the morning. And we know the physiology to that, which brings us back to whether we were designed to nap. So for naps, we've done lots of different studies and other colleagues have done these studies too. Naps can have some really great benefits, we found benefits for cardiovascular health, blood pressure, for example, we found benefits for levels of cortisol, we found benefits for learning and memory, and also emotional regulation. - How long are the naps, typically, in those studies? - Anywhere between 20 minutes to 90 minutes. Sometimes we like to use a 90 minute window so that the participant can have a full cycle of sleep, and therefore they get both non REM

and REM sleep within that time period. Then when we wake them up, we usually wait a period of time to get them past what we call sleep inertia, which is that kind of window of grogginess where you say to you, better half look, you know, darling, please don't speak to me for the first hour after I've. - Don't anything right now. - After the first hour of waking up, you know, I'm not just, I'm just not the best version of myself. So we wait for that time period, and then we do some testing. And we've done some testing before and after, and we look at the change. And that's how we measure what was the benefit of naps and the reason why we sometimes do 90 minutes so that they get all of those stages of sleep. And then we correlate, how much benefit did you get from the nap, and how much of that benefit was explained by what REM sleep you got, what deep sleep you got, what light sleep you got? So that's the only reason that we use that as an experimental tool. What we've also found is that naps of as little as 17 minutes can have some quite potent effects on for example, learning. None of this is novel, NASA pioneered this back in the 1990s. And during the missions, they were experimenting with naps for their astronauts. And what they found was that naps of little as 26 minutes, improved mission performance by 34%, and improved daytime alertness by 50%. And it birthed what was then called the NASA nap culture throughout all terrestrial NASA staff during that time period. So it's long been known that naps can have a benefit. Naps, however, can have a double edged sword there is a dark side to naps. And it comes back to our story of adenosine and sleep pressure. The longer we're awake, the more of that sleep pressure adenosine that we build up. But what I didn't tell you is that when we sleep, the brain gets the chance to essentially clear out that adenosine. And after about 16 hours of wakefulness, and then after about eight hours of sleep, eight hours of sleep seems to be able to allow the brain to decrease its adenosine levels back to normal. And so naturally, we should start to wake up which also aligns with your circadian rhythm. And those are two separate processes. But with about eight hours of good quality sleep seven to nine hours for the average adult, we are free of all of that adenosine. We've evacuated it essentially out of the brain, and we wake up naturally feeling refreshed. The reason that naps can be potentially dangerous is that when you nap, you are essentially opening the valve on the pressure cooker of sleep pressure. And some of that sleepiness is lost by way of the nap. So for some people and not all people and you're a great example of this. Some people, however, if they are struggling with sleep at night, and they nap during the day, it makes their sleep problems even worse. So for people with insomnia, we typically advise against napping. And the advice is if you can nap

regularly, and you don't struggle with sleep at night, then naps are just fine. But if you do struggle with sleep, stay away from naps. If you are going to nap, try to limit your naps, try to cut them off a bit like sort of caffeine, maybe you know, eight to 12 hours maybe not that you know far off maybe sort of seven to six hours is a good rule of thumb. Try not to nap essentially late in the afternoon. And if you do take a nap and you want to maintain your you don't want to have that grogginess hangover that can happen after a full night of sleep for the first hour, try to limit it to about 20, 25 minutes. And that way you don't go down into the very deepest stages of sleep, which if I wrench you out of with an alarm, then you just kind of feel you almost feel worse, for the first hour after the nap. - I've definitely experienced that if I oversleep. Certainly if the sun goes down during my nap and I wake up and light overall lighting conditions have changed, I find it very hard to jolt myself back into the evening. And it can screw me up. So I try and keep those naps pretty brief. And I should say, I'm very happy to hear you mention individual differences and why some people might want to nap and other people might not want to nap, I have a colleague Liqun Luo he'll be familiar to many neurobiologist. - Yeah of course. - Who's a absolutely spectacular scientist, member of the National Academy, Howard Hughes investigator just a phenom, and has a ton of energy. But years ago, I learned that he always takes a nap in the afternoon, so much so that when he travels to give seminars at other universities, he will tell his post lunch host whoever it is that he's supposed to meet with, may I have your office for 30 minutes of our, sometimes 30 minute discussion or 60 minute discussion, because I like to take a nap. And he does that and then gives us his, his talks are typically in the afternoon in academic culture. And he describes the effect of the nap for him this short naps in the afternoon being so profound for his productivity. That's actually what inspired me to start feeling okay about my desire to nap. And so I think for me, that was great vindication for those that might feel guilty about wanting a nap. But I take to heart your note about avoiding naps if you have trouble falling and staying asleep, 'cause I think that I have family members who also if they nap, they're a wreck, they can't sleep. - Yeah, I think it's just, we've often been very pro sleep with sort of the sleep community. So I think it's good to always point out these potential dark sides of any aspect. But you're absolutely right, no one should feel guilty about getting the sleep that they need. And I think that's been one of the big problems in society society has stigmatized sleep with these labels of being slothful or lazy. And we're almost embarrassed, you know, to tell colleagues that we take a nap. I think sleep is a right of human beings. And I therefore think that sleep is a civil right of all

human beings. And no one should make you feel unproud of getting the sleep that you need. - No, I love that. And I it's an important point. I also feel that one of the best ways to beat your competition in any endeavor is to outlive them. So now that we know that sleep can enhance longevity and lack of sleep can shorten one's life,

02:28:23 Is It Possible To Get Too Much Sleep?

that's all the justification I need anyway. Can somebody sleep too much? Is it possible to get too much sleep? - It's a very good question. And there are probably two things to say about it, there is a condition that we call hypersomnia. But that's a mixture of things, it's where people have either a very high sleep need, or they are very sleepy during the day. And they're typically falling asleep. And these can happen in a variety of different clinical contexts. One of the places where we've often seen hypersomnia believed to manifest is in depression. But if you look at some of those studies, it turns out, it looks more as though those people are simply reporting being in bed longer, but not necessarily sleeping longer. And that fits very well with one of the profiles that we know of depression, which is anhedonia, you don't get pleasure from normally pleasurable things. So you just don't want to go out into the world, you don't want to interact because you're depressed. So what do you do? You just stay in bed? - Blinds closed, watching TV, on the phone. - [Matthew] Right, and that just looks as though you know, - Felling miserable. - When people say, what time did you go to bed? And what time did you get out of bed? The mistake made in that question is okay, that's how much time their sleeping when you should have said, what time did you fall asleep? And what time did you wake up? And the answer could be very different. So that's hypersomnia from a clinical context. Can you sleep too much though? One of the data points that argues yes, that's possible is when we look at all cause mortality. Certainly what you find is that using the sweet spot of seven to nine hours, when you start to draw below seven hours, there is a relationship, which suggests that the shorter your sleep, the shorter your life. Short sleep in that regard predicts all cause mortality. But it's again, not a linear relationship like the one that we've seen with REM sleep. Once you get past nine hours, the mortality curve stops going down. And then once you get further 10 or 11 hours, it hooks back up again, it's almost like a J shape, tilted over a little bit and reversed. So there's this strange hook, what's going on here? Right now, sleep science has at least two non mutually exclusive explanations for this. The first is that if you look at some of

those populations, the idea is that the whatever was causing them illness and took their lives was just too much for sleep to deal with. However, we know that when we get sick, one of the things that we do immediately in this whole mechanism and inflammatory mechanisms cytokine mediated, when we get sick, we want to sleep more. We just want to curl up in bed and you know, sleep it off. So the argument there is that it's not that sleep was killing people prematurely, it was that these people were calling on this the help of sleep, they were calling on this thing called the Swiss Army Knife of health, that is sleep. But whatever it is that they were facing was just too powerful for sleep to overcome. So it artificially looks as though more sleep leads to a higher risk of death, when sleep is actually responding to the mortality risk, and it lost the battle. That's one argument. The second is that we know that sleep quality and poor sleep efficiency is a very strong predictor of all cause mortality. And when you look at people who often report sleeping longer amounts, 10 or 11 hours, they typically report having very poor quality sleep. So because their quality of sleep is poor, they just try to sleep longer to try and get some of that back. So again, here now it's poor quality sleep masking as too much sleep leading to this artificial hook which looks like mortality. That's the second explanation. A third which is more of a Gedanken, which is just the kind of like a thought experiment and I have this mentality, I don't know how many other people share this. I actually think that could be a thing as too much sleep. Physiologically, I think it's possible. But the reason I think that is because it's no different than food, water or oxygen. Can you overeat? Yes, you can. Can you under eat? Of course. - Or light. light in the early part of the day, throughout the day, wonderful. Light late in the day and at night, detrimental. - Bi-directional, you know, for water, can you over hydrate, hyponatremia it can lead, you know, it happened in the 1990s and 2000, with the ecstasy craze, where governments were saying you're dehydrating you're dancing all night, please drink water. And they drunk too much water, their blood electrolytes went you know, all over the place, and they were having cardiac arrests or stroke. - Yeah people were dying. - And they were dying because of excessive hydration. Can you get too much oxygen, hypoxemia? And it can cause free radical damage, which can be profoundly harmful and kill brain cells. Can you sleep too much? You know, which is the fifth element of the life equation, you know, alongside you know, food, water, oxygen, you know, so forth. I should say I can't even count. Clearly I'm sleeping well. Yes, I think that could be that possibility. Are most people in danger of getting too much sleep? Or contrary, if you look at the data. So but I don't dismiss that idea. I think it's possible. -

That's a very thorough and very nuanced, and yet very clear answer. So I, it's so interesting to think that a lot of the data that's out there that talking about being in bed too long that it's just trying to compensate for the actual fragmentation of sleep. So what I'm coming away with is that there are many paths to this and both positive and things to avoid. But the idea is to get most nights, a similar amount, probably seven to nine hours, somewhere in there, of high quality sleep. That this notion of sleep quality is going to become,

02:34:35 Sex, Orgasm, Masturbation, Oxytocin, Relationships

I would hope, a phrase that more people think about and learn about and cultivate as a practice. I want to ask about a set of behaviors that I'm at least I'm aware of at least one company is starting to track in their sleep monitoring device, and that's orgasm, and sex orgasm and masturbation topics that are, you know, are somewhat sensitive. But from the perspective of biology, right, none of us would be here were it not for sperm meets egg in some fashion, either in a dish or in vivo. But what are the data as you know them to be or maybe your lab is even doing this kind of work and exploration about the role that sex, orgasm, masturbation play in getting to sleep and staying asleep and sleep quality? Certainly those behaviors and those physiological events have been part of our evolutionary history. What's the story there? What can we say about this in terms of science and dare I say practice? - Yeah, I mean, it's almost that caricature of you know, in the movies where, you know, a couple makes love and then all of a sudden, you just sort of hear snoring or, you know, that happens with the idea that it somewhat some neurogenic that it's sleep promoting. - Well, the post orgasmic increase in prolactin. - Well, that's very, is interesting. - Is thought to be a set a naturally occurring sedative, that presumably has a function in. - And oxytocin has that also that benefit where you see, you know, a dissipation of the fight or flight branch of the nervous system, which has to happen for you to fall asleep. That's why we often see, you know, here at The Sleep Center, we'll see a phenomenon called wired and tired where people say, look, I am so desperately tired I just I'm so so tired, but I can't fall asleep, because I'm too wired. So your sleep drive, you're desperately tired, it's there but because you're wired, because you've got too much sympathetic activation, too much cortisol as well, you can't fall asleep. It's an impressive roadblock to anything like good sleep. And it's one of the principal mechanisms that we now believe stress and physiological activation, that is the

underlying cause of many forms of insomnia. But coming back to sex, the data is actually quite compelling, that both either subjectively assessed sleep quality, or objective amount of sleep, sex that has resulted in orgasm, and I think it's that latter part that typically needs to happen. - I would imagine so. - That, you know, so between two mutually exclusive individuals, where both are, you know, beneficial in terms of receiving an orgasm. [cross talking] - Yeah, I would say any discussion about sex, we were referring to consensual, age appropriate, species appropriate, context appropriate. - Wow, I would never have even gone to the species appropriate. - I put species in there because it's the internet, and people will come up with all sorts of ideas. So I think that age appropriate, I think age appropriate, consensual, context appropriate and species appropriate, covers all the bases, but if I missed any, put them in the comment section, and we'll be sure to take note. - Yeah, no, I think that's really well said and important to say. So the data that is the when you look at couples who have orgasm. We've also, however, found benefits of masturbation, and it's not frequently spoken about. But what if you do some surveys, it turns out that people will often use masturbation as a sleep tool, if they're struggling with sleep. And I know, this sort of sounds almost like a strange conversation, or it's a taboo conversation but I think we just need to be very open about all of this. - I started off in science, one of the things I worked on early in my career, not the very first topic was the topic of early influences of hormones, estrogen and testosterone on sexual development of the brain and body. And when you are weaned in a laboratory like that, regardless of what era, you look at sex and its behaviors, and its hormones, and its physiologies as a scientist, and so that's to be clear what we're doing here, we're exploring these behaviors from that perspective. I mean, one thing is for certain, everyone is here because a sperm met an egg, either in a dish or in vivo, as we said before, and at least in 2021, there's no way around that fact. And what preceded that is typically this act we call sex and sometimes, hopefully, I like to think orgasm is associated with that sexual activity. Masturbation is one dimension of that is something that I think it can and should be discussed, if in fact, there are data that relate it to sleep. - Yeah, and both of those routes seem to lead to a sleep benefit. Now, I'm not saying that it's all about the orgasm. I think as we spoke about with oxytocin, there is some degree of par bonding that if you have a partner, and you experience you know, an intimate loving, you know, relationship that involves that, then you can have hormonal benefits that are sleep promoting, that may not necessarily be seen if you're just engaging you know, in the solo singular act of masturbation. So what we certainly know

and I am not someone to take any advice on when it comes to anything relationship wise or sex wise. - That's a different episode of the podcast. - Yeah, yeah certainly. And that's not a podcast series that I'm going to be releasing anytime soon, it's going to be mostly about sleep. Although I will touch on, I'll release a podcast on sleep and sex. But that's the data that we have so far. We also know that it works both ways, though. And it's commonly the same way with sleep. You know, sleep and exercise, sleep and diet. How you eat can affect how you sleep, how you sleep can affect how you eat. Same with exercise. And it turns out, it's the same way with sexual behavior, too. So here, we're talking about whether sex can help with sleep. Can sleep help with your relationship and sex? And the answer is, yes, it can. Firstly, we know and we've spoken a little bit about this, that the reproductive hormones are under profound sleep regulation. - Both estrogen and testosterone, I understand. - Estrogen, testosterone, as I said. - Cause we hear so often about testosterone. But women who, or I should say anyone who's interested in having higher levels of estrogen or normal healthy levels of estrogen I presume the data show for estrogen what the data also show, similarly for testosterone. Which is if you get too little or poor quality of sleep both sex steroid hormones, as they're referred to testosterone and estrogen, which are present in both males and females and every variation thereof, are going to be diminished below normal healthy levels, correct? - Yes, estrogen, testosterone, FSH in women, a key hormone in the regulation for, key for conception, of course, all of these sex hormones seem to become significantly disrupted when sleep becomes of short quantity, or poor quality. We also know that in women, sleep disruption can usually lead to menstrual cycle disruption. We know this, particularly from evidence in shift working women where they are nighttime shift workers, they struggle with sleep during the day, often menstruation is disrupted or even becomes impaired. But we also know it works this way, not just for sex hormones, but for sex itself. For example, we found that for every one hour of sleep, extra sleep that a woman gets her interest in becoming sexually intimate with her partner increases by 14%, which is, you know, a non trivial amount. - Substantial. - And then the final part of I think this equation when it comes to sleep, and sex is your relationship itself. And there's some great work here from UC Berkeley by Professor Serena Chen. And what she found was that restless nights mean for far more brutal fights in your relationship. And they did this. - And vice versa. - A number of different elegant ways, and vice versa as well. - I mean, not that I've ever had conflict in relationships. [cross talking] - You know, just this is data I've read, I've never experienced that at all. So, they found reliably that sleep would

predict higher likelihood of relationship conflict. Secondly, if you got into that conflict, the chances of you resolving it were significantly lower when the parties had not been sleeping well. Part of the reason is because when you are not well slept, your empathy goes down. So you're not, you're taking more of an abrasive stance with your partner, rather than a more agreeable stance with your partner. So at almost every dimension of a human loving relationship, sleep can have a dramatic impact. - I think these are really important things to underscore, one of the most common questions I get, because there seems to be community of people on the internet that are obsessed with this. I don't know who they are, because it's all, all this internet stuff is shouting into a tunnel and getting comments back in written form. It's a very bizarre conversation, so to speak. Is whether or not sexual behavior itself lowers or increases testosterone? And I went into the data, which spans many decades actually, both animal studies and human studies. And it seems just to underscore this as long as we're talking about this subject that it does seem that sexual activity, sex between two people does seem to increase testosterone in both. There is this question about orgasm or no orgasm ejaculation, no ejaculation and indeed, there do seem to be some effects of restricting ejaculation in males as a form of further increasing testosterone. So sex without ejaculation further increasing testosterone. But the data are not clean. Presumably because organizing these sorts of studies and getting truth in self reporting is probably hard to get from subjects. But everything sort of points in the direction that provided that the relationship is a healthy one, it's consensual, it's age appropriate, context appropriate, species appropriate that sex between two individuals does seem to increase the sex steroid hormones testosterone and estrogen toward healthy ranges. And what I'm hearing now this sort of Gestalt of the discussion we just had is that that too can promote sleepiness, restful states, and quality sleep. And I think this is an important conversation that just hasn't been held enough. I mean, sooner or later, both in the US and elsewhere, we're going to have to acknowledge that we are biological organisms of some sort, and that we have choice in life, about all these things, from supplementation to sex, or no sex, et cetera, but that they have profound effects on our core biology. I mean, it's fascinating to me that the areas of the hypothalamus, the preoptic area, the super optic areas, those areas which the names might not mean anything to anybody, besides Matt and I sitting here, but those areas sit cheek to jowl with each other in the hypothalamus and control, sleep and sex. The trigger of orgasm, the appetite for food, the appetite for water for electrolytes. I mean, the hypothalamus is kind of a festival of neurons with different

booths for different primitive behaviors. - It's such a small, small structure in the brain, but it's the orchestrator of a vast number of our behaviors disproportionate in terms of its size versus effect. - Yeah, I don't think you can go to this hypothalamic festival without at least seeing all the booths whether or not you decide to visit them or not. - I love that master analogy. - So I'm glad that we've broached that conversation. And I hope people will think that we've approached it with the appropriate level of sensitivity. It's an important one that we're going to hear more about one way or the other. People are certainly thinking about this, if not engaging in these sorts of behaviors or avoiding them. So the more we can understand about the biology, the better. And so thank you for bringing that topic up. Because for the record, Matt, tabled it for discussion. - We were just like chatting outside and I think we said something about sort of sex,

02:47:30 Unconventional Yet Powerful Sleep Tips

and I said we can go there. There is so much interesting data. - Absolutely, I want to touch on just two remaining topics. One is are there any unconventional sleep tips or things about sleep that we've overlooked? If we've covered everything great, but you know, we hear to keep the room cool. We hear because of this temperature phenomenon, the light aspects, the considerations about alcohol, CBD marijuana, cognitive behavioral, tart cherry fruit, kiwi perhaps. - Please don't put me on the hook for tart cherries and kiwis, I was just offering what I know about the data. - And these are considerations and whether or not people batch these things, I won't even list them off now, because they're too many jokes that one could make. - And I have no affiliation with any of these products. [cross talking] - Well, I'm going to take out stock in a kiwi company. No I'm just kidding. But the question I have is about any unconventional or lesser known things, or maybe you do things or you think about things just in a purely exploratory way, as a scientist of that, you know, the what if kind of things that, yeah, what if it turns out that and I hear I just, I got a blank there for you to fill in. - I think, you know, beyond the standard, you know, fair that I've dished out plenty of times of sleep hygiene of you know, regularity, temperature, darkness, alcohol, caffeine, and we've spoken about all of those. What are some more unconventional tips, I guess? The first one, which is unconventional along the lines of naps. If you've had a bad night of sleep, let's say that you're starting to emerge with insomnia and you've had a bad night of sleep, the advice and I learned this from my wonderful colleague, Michael Perlis, do

nothing. What I mean by that is, don't wake up any later, don't sleep in the following day to try and make up for it, don't nap during the day, don't consume extra caffeine to wake you up, to try to get you through the day, and don't go to bed any earlier to think that you're going to compensate. And I can explain all of those things. But if you wake up later, you're not going to be sleepy until late in the evening, so you're going to go to bed at your normal time and you won't be sleeping, you'll think well, I just came off a bad night of sleep. And now I still, I can't even get to sleep and it's my normal time. It's because you slept in later than you would otherwise, and you reduce the window of adenosine accumulation before your normal bedtime. So don't go, don't wake up any later. Don't use more caffeine for the reasons that are obvious, because that's only going to crank you and keep you awake the following night or decrease the probability of a good following night of recovery sleep. Third, I mentioned don't take naps, because once again, that will just take, you know, naps, particularly later in the afternoon, I almost liken them to snacking before a main meal, it just takes your appetite off the edge of that main meal of sleep, so don't do it. And then finally, don't go to bed any earlier, resist and resist and go to bed at your normal time. What I want to try and do is prevent you from thinking I had such a bad night last night and I normally go to bed at 10:30, I'm just going to get into bed at nine o'clock, because last night was just so bad. But that's not your natural bedtime, and it's not aligned with your natural chronotype because presumably you kind of know something about that, our morning time, evening time, you're trying to sleep in harmony, which is usually how you get best quality sleep. But you go to bed at nine, and my body is not ready to sleep at nine o'clock. But I'm worried because I had a bad night of sleep last night so I get into bed, and now I'm tossing and turning for the first hour and a half because it's not my natural sleep window, but I just thought it was a good idea. And if I didn't know anything about sleep, I would think all of these same things too. So I'm not finger wagging. But after if I have a bad night of sleep, and I am not immune, just because I know a little bit about sleep doesn't mean I don't have my bad nights, I do. Doesn't mean I haven't had bouts of insomnia in my life, I have. But after a bad night of sleep, I do nothing. I don't do any of those four things. I think the second tip I would offer in terms of unconventional is have a wind down routine. Many of us think of sleep as if it's like a light switch, that we just jump into bed, and when we turn the light out sleep should arrive in that same way. Just the binary you know it's on or it's off. Sleep is a physiological process, it's much more like landing a plane, it takes time to gradually descend down onto the terra firma of what we call good solid sleep at night. Find out

whatever works for you and it could be light stretching, I usually meditate for about 10 or 15 minutes before bed. Some people like reading, try not to watch television in bed that's usually advised against. - Something that doesn't emit too much light to your eyes. - Too much light, too activating, you know, you can listen to relaxing podcasts, although we can speak about technology in the bedroom too. But have some kind of a wind down routine. It's you know, it's almost like you know, you wouldn't race into your garage and come to a screeching halt from 60 miles an hour, you typically down, shift your gears and you slow down as you come into the garage, that's the same thing with with sleep too. So that's the second thing, have some kind of a wind down routine, find what works for you. Maybe it's taking a hot bath or a warm shower, and then stick to it. Just we do this with kids all the time, we find out what their bedroom, sorry, their bedtime regiment is and then we just stick to it faithfully 'cause we humans are the same way too. The third thing is a myth, don't count sheep. There's a study done here at UC Berkeley, I didn't do this today, I wish I did, it's by my colleague, Professor Allison Harvey. And they found that counting sheep actually made it harder to fall asleep. It made matters worse. As a conter sorry counter measure to that what they did find was that taking yourself on some kind of a mental walk, so think about a nice walk that you take in nature or a walk on the beach, or even a walk around an urban environment. - Just visualizing that. - And visualizing that, that seemed to be beneficial. The other thing about sort of that idea of shifting focus away from your mind itself, get your mind off itself is a good piece of advice. Catharsis, you can try to write down all of the concerns that you have, and do this not right before bed, but usually an hour or two before bed. Some people call it a worry journal. And to me, it's a little bit like closing down all of the emotional tabs on my browser. Because if I shut the computer down and all of those tabs are still open, I'm going to come back in the morning, and the computer's red hot the fans going because it didn't go to sleep, because it couldn't because there were too many tabs active and open. I think it's the same way with sleep as well, so try to think about doing that. So just vomit out all of your concerns on the page. - I like that, cause my 3am waking is often associated with me writing down the list of things that I forgot to do that I need to do. And once I eventually wake up from the later night, second half of the night's sleep, that stuff seems much more tractable and reasonable, but it sure would be great to get that stuff out of the way before sleep. - Well, there's also something that I don't think people have spoken about a lot. And I'd like to research it, which is difficulty and anxiety at night in the dark, is not the same difficulty and anxiety in the light of day. And when we have

those thoughts at night, it comes with a magnitude of rumination and catastrophization that is disproportionate to that which you would describe when you are awake. And I don't know what's going on about the brain, and thought and emotion at the time, I've got a bunch of theories as to why, and that's why I like the idea of closing up zipping up all of those different components, just get them out on the page. And it feel, and I at first thought this just sounds like who its it sounds very Berkeley, it's kind of Kumbaya, we all hold hands, and, you know, we all come at the end of the day. But then the data started coming out really good studies from good people. And they found that keeping one of those journals decreased the time it takes you to fall asleep by 50%, five, zero. - Amazing that's substantial. - That's well on par with any pharmaceutical agent. - I'm convinced that I've long thought that the worries and concerns and ideas I have at three, 4am I've learned to not place any stock in them. Because something, I'm glad that you might decide to eventually look at this in your laboratory because I feel like something is melted away or altered. I suspect it's in the regulation of the autonomic nervous system, that it makes sense why a concern at three, 4am ought to evoke more of a panic sense than a concern sense. And certainly, that's my experience, although not, fortunate to not suffer from full blown panic attacks. But everything seems worse at three, 4am provided you're awake. - And we need to sort of look into that because, you know, if you look at suicide rates, around the 24 hour clock face, disproportionately higher rates in those middle sort of night hours. So now, I don't know if that's causative or not, but something you know, it could just be that that's the time when we're mostly lonely, and we're by ourselves. And that's the reason. So it's got nothing to do with sleep or the night time, I don't know. So that's the third thing, I think the fourth sort of little tip I would give that's unconventional, is remove all clock faces from your bedroom. - Including your phone. - Including your phone, and resist checking it. Now I know and I can speak about the phone too that genie of technology is out the bottle. And it's not going back in anytime soon. So we've got to think a scientist and sleep scientist, you know, as to what we do with you know, phones in the bedroom. - Years ago, I was a counselor at a Summer camp I worked with at risk kids and there was a phrase that comes to mind here, it's be a channel, not a dam. Because when you try and dam certain kinds of behavior, physically dam certain kinds of behavior and not morally dam, that too, it just creeps over the edge, and you get a waterfall. So it has to be a channel. The phone and devices have to be worked with and negotiated not eliminated. - That's right and you know, think about those mindfully too but clock faces, remove all of those, because if you are having, you

know, a tough night, knowing that it's 3:22 in the morning, or it's 4:48 in the morning, does not help you in the slightest. And it's only going to make matters worse than better. So try to remove all clock faces. And I think that's one of those other tips that some people have found helpful. But those would be sort of some slightly unconventional, I guess more than your stock fare of here are the five tips for sleep hygiene tonight, so. - Those are terrific sleep tips,

02:59:10 Connecting to & Learning More from Dr. Walker

and several of which, if not all of which I'm going to incorporate. Matt, this has been an amazing, deep dive on sleep and it's positive and negative regulators. - I hope it hasn't been too long. - No this has been great. - Please cut it down, shorten it to, you know, the five minutes of meaningful stuff that I offered. - Absolutely not, it is chock a block full of valuable takeaways. It's been tremendously fun for me to dissect out this incredible aspect of our lives that we call sleep with a fellow scientist and a fellow public educator. I want to say several things. First of all, we should say where people can find you although it shouldn't be that difficult these days. You're a very present on the internet. - [Matthew] Unfortunately. - For better or for worse. I think it's wonderful that you're out there. Look, it's a public health service that you're doing. No one requires you or any other scientist to get out and share this information. My sense of you knowing you a bit, and from following your work very closely both your scientific work in detail and your public facing educational work is that you very much want the best for people. And it's an interesting thing as a scientist or a clinician, to know that the that certain answers exist, that we don't have all the answers, but that there is a better path, there are better ways and people can benefit in a myriad of ways. So, for that, because I know that to be very genuine in you, you want the best for people and you're offering tremendous advice and considerations and people can take it or leave it that's the way I view it. I also want to thank you for taking the time out of your day to sit with me here and have this discussion. - Not at all, no at all, it's a privilege, it's a delight, you know, you and I, I think we're alike kind in lots of ways. And I take you as a shining example of how you can effectively connect with the public. And I know that we've had our conversations before we ever sat down to talk together about, you know, how to think about communicating with the public and the pros and cons of that. And I've just loved your opinions. I've been drinking it all in. And then I think the third thing I'd like to say is, thank you for being such

an incredible sleep ambassador, the series that you've released on sleep, the way that you speak about sleep, the way that you moderate and have championed sleep. It is remarkable. So thank you for just being you know, a brother in arms in that way. - But we are and thanks for those those words. 99% of what I discussed there was the work of you and your colleagues in the sleep field. So proper acknowledgement, but thank you, where can people learn more about what you're doing currently? And what's coming next? You're on Twitter. - I am on Twitter I typically tweet. - As the sleep diplomat. - So, no it's just sleep diplomat - Sleep diplomat on Twitter. - Sleep diplomat on Twitter, sleepdiplomat.com website, if you want to learn more about the science that we do here, it's humansleepscience.com. It's the Center for Human Sleep Science. You can pick up a copy of the book, if you want. It's called "Why We Sleep?" if you're curious about sleep, that's one path to take and it's my view. - Is there another might someday in the future? - I think there may be, yeah. - Great, great, many, many millions of people will be very happy to hear that. - I think it's starting to take hold. And then as we discussed, I am more than kicking around the idea of a short form podcast rather than a long form, not long form, because I don't have the mental capacity or the interviewing, just capability that someone like you has. So it will probably just be monologue short form. So if there is some interest, I'll probably do that as well. So those are the ways that people can find me. But overall, if you're interested in sleep, just listen to Andrew. That's thing I can tell people. - All right, well now we're bating back and forth the vector of action so to speak, but I do hope you'll start a podcast however brief or lengthy these episodes turn out to be because I do believe that's a great venue to get information out into the world. And we don't just want to hear more from Matt Walker, I speak for many people, we need to, the work you're doing is both influential, but more importantly, it is important work. It has the impact that's needed, especially in this day and age where science and medicine, public health, and the issues of the world, etcetera, are really converging. So I know I speak on behalf of a tremendous number of people, when I just say thank you for doing the work you do and for being you. - [Matthew] Thank you. - And thanks for being a good friend. - Likewise, too and by the way, I'm just going to note that it was nice that the two of us both got the Johnny Cash memo about how to dress today. It seems as though we're both kind of we got that same memo, which will mean nothing to people who are listening, but if you're watching the video, you'll probably see what I mean. Andrew, thank you for taking this time. Thank you so much. - Thanks so much Matt. Thank you for joining me for my discussion with Dr. Matt Walker. Please also check out his podcast

the Matt Walker podcast. A link to that podcast can be found in the show notes. If you're enjoying this podcast,

03:04:42 The New Dr. Matt Walker Podcast, Reviews & Support

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