

Focus Toolkit: Tools to Improve Your Focus & Concentration | Huberman Lab Podcast #88

In this episode, I provide a list of behavioral, nutritional, and supplement-based tools you can use to improve your ability to get into a focused state to do mental or physical work. I explain science-supported strategies for transitioning into focus, maintaining focus during the work bout, and exiting the focus session, which is also critical, including decompression/defocusing tools. I explain when and how to use: binaural beats, caffeine, deliberate cold exposure, the pros and cons of working in fasted vs. fed states, and supplements and foods that enhance dopamine, epinephrine (i.e., adrenaline) and acetylcholine to promote optimal focus. Also, I explain how short behavioral practices, such as meditation and visual gaze training, will benefit your ability to focus over the long term. As deep focus is crucial to significantly improve cognitive or physical performance in any realm, this episode should be useful to anyone. By the end, you'll have an essential toolkit of science-supported, low- to zero-cost focus and concentration strategies to select from that can be tailored to your physical and mental performance needs.

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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 we are discussing focus and concentration and tools for improving your focus and concentration. This is a topic that I've covered previously on the Huberman Lab Podcast, but in different contexts. For instance, we had a very popular episode on ADHD, attention deficit hyperactivity disorder, which of course relates to the topic of focus and how to improve focus. We've also talked a lot about dopamine motivation and drive. In fact, that's the title of your previous also quite popular episode of this podcast, but never before have we had a single episode solely devoted to the tools to improve focus and concentration. The rationale for recording this episode is to provide people one location where they can go and quickly access the specific tools for increasing focus and concentration that are known to be the most powerful tools and the most up to date tools. In fact, today's episode is going to include description of several peer reviewed studies and the tools that emerge from those scientific peer reviewed studies that point to new, and fortunately, even briefer protocols than I've described before. So what I'm basically describing here is tools that in a very short amount of time will allow you to significantly increase your focus and concentration abilities. Those tools will include behavioral tools, nutrition based tools, supplement based tools, brain machine interface based tools, and for those of you that are working with a physician, prescription drug tools. Today's episode ought to benefit anybody, young or old or anything in between whether or not you have ADHD or not. Today's episode is going to give you tools that you can apply in your daily life, most all of them are completely zero cost and those tools will allow you to tap into the neurochemistry and the neurocircuits within your brain and body that peer-reviewed science has reliably shown can significantly improve your focus and concentration abilities. Just to give you a little teaser of the kinds of tools that I'm going to provide you on today's episode, a previous guest on the Huberman Lab Podcast was Dr. Wendy Suzuki. Dr. Suzuki is a professor of psychology and neuroscience at New York University, or NYU as it's commonly referred to. She's also the Dean of Arts and Sciences at NYU. Her laboratory made a very important discovery, which was that a very brief, just 12, actually 13 if you really count the intro, but 13 minute daily meditation performed for a period of about eight weeks significantly increased people's focus and concentration abilities. And the great news is you didn't need all eight weeks, it was just that's how long that you ran the study. So during today's episode, I will describe that

protocol in detail. I'll also provide you an even briefer alternative to that protocol that you can use, if for instance, you find yourself with only three minutes or four minutes or five minutes a day to meditate. The great news is there's quality peer reviewed science to support that form of meditation for improving focus and concentration. And that falls under the bin of these zero cost tools that you can really use to tap into the neurochemistry and neurocircuits that really allow you to take control of your cognitive abilities and improve them over time. I'll also provide you important details about that protocol and other protocols. For instance, contrary to popular belief, it is not, I repeat it is not a good idea to do a focused based meditation within the four hours before bedtime. Many people, including some of the subjects in that study performed by the Suzuki lab, found that when they did a focusing meditation protocol, even if it was very calming, it led to difficulties in falling and staying asleep. So that runs counter to a lot of what we've heard about meditation being great for sleep. It turns out meditation might be great for sleep, it certainly is great for improving focus capacity, but I highly recommend that if you're going to apply a focus meditation tool in order to improve your focus and concentration, that you make sure that that's performed not within four hours prior to bedtime. So that's just a brief example of the sorts of tools and protocols and details about the tools and protocols that I'll provide on today's episode. I should mention that we have provided links in the show note captions so that you can quickly go to the studies that we describe as well as some of the behavioral tools and other tools that we'll cover, things like the use of binaural beats, supplements, et cetera. Our goal here again is to provide you the maximum number of tools for focus and concentration that you can pick from and choose from and apply in your life

00:04:25 Momentous Supplements

and try to eliminate as much of the legwork required to seek out and apply those tools. I'm pleased to announce that the Huberman Lab Podcast is now partnered with Momentous supplements. We partnered with Momentous for several important reasons. First of all, they ship internationally, because we know that many of you are located outside of the United States, that's valuable. Second of all, and perhaps most important, the quality of their supplements is second to none, both in terms of purity and precision of the amounts of the ingredients. Third, we've really emphasized supplements that are single ingredient supplements and that are supplied in dosages that allow you to build a

supplementation protocol that's optimized for cost, that's optimized for effectiveness, and that you can add things and remove things from your protocol in a way that's really systematic and scientific. This is really hard to do if you're taking blends of different supplements or if the dosages are such that you can't titrate, or that is adjust the dosages, of a given supplement. So by using single ingredient supplements, you can really build out the supplement kit that's ideal for you and your specific needs. If you'd like to see the supplements that we partner with Momentous on, you can go to livemomentous.com/huberman. There you'll see those supplements. And just keep in mind that we are constantly expanding the library of supplements

00:05:38 Thesis, LMNT, Eight Sleep

available through Momentous on a regular basis. Again, that's livemomentous.com/huberman. Before we begin, I'd like to emphasize that this podcast is separate from my teaching and research roles at Stanford. It is, however, part of my desire and effort to bring zero cost to consumer information about science and science related tools to the general public. In keeping with that theme, I'd like to thank the sponsors of today's podcast. Our first sponsor is Thesis. Thesis makes custom nootropics. And to be quite honest, I don't like the word nootropics because the translation of nootropics is smart drugs. And as a neuroscientist, I can tell you there is no neural circuit in the brain for being smart. Rather, there are neural circuits that are responsible for focus, neural circuits for creativity, neural circuits, for task switching and so on and so on. Fortunately, Thesis understands this and has developed custom nootropics that are tailored to your specific goals and your specific needs. They use only the highest quality ingredients, things of the sort that we'll talk about in today's podcast, things like Alpha-GPC, phosphatidylserine, ginkgo biloba, et cetera. However, I should mention that they are customized to you. So you can go to Thesis, take a brief quiz, and you can get a nootropic starter kit that will allow you to try various nootropics and determine which ones you like and work for you and which ones don't. I've been using Thesis nootropics customized for me for close to six months now and can confidently say that their nootropics have been a total game changer. My go-to formula is the Clarity Formula, I like to use that before cognitive work, and I use the Energy Formula before my workouts. To get your own personalized nootropic starter kit, go online to takethesis.com/huberman, take that three minute quiz and Thesis will send you four

different formulas to try in your first month. Again, that's takethesis.com/huberman and use the code Huberman at checkout to get 10% off your first box. Today's episode is also brought to us by LMNT. LMNT is an electrolyte drink that has all the things you need and none of what you don't. That means the electrolytes, salt, magnesium, and potassium are in there, but it does not have sugar. Electrolytes are key to cellular function, in particular neuronal or nerve cell function. In fact, for your nerve cells to be able to fire action potentials, those are the electrical signals that allow your brain and body to work and move and think, et cetera, you need sodium, a lot of people don't realize that. And while of course there are people out there that need to reduce their sodium intake, these would be people with pre-hypertension or hypertension, many people actually don't get enough sodium, especially people that are following low carbohydrate diets, drinking a lot of caffeine or eating extremely clean. Oftentimes, those people feel better when they increase their sodium intake and their health can actually improve when they increase their sodium intake. LMNT contains a science backed electrolyte ratio of one gram of sodium, 200 milligrams of potassium and 60 milligrams of magnesium. If you'd like to try LMNT, you can go to drinklmnt.com/huberman to claim a free element sample pack with any purchase. Again, that's drink LMNT, l-m-n-t.com/huberman. Today's episode is also brought to us by Eight Sleep. Eight Sleep makes smart mattress covers with heating, cooling, and sleep tracking capacity. The reality is that sleep is the foundation of mental health, physical health, and performance. Now I've talked before in this podcast about the fact that there's a direct relationship between temperature and our ability to fall and stay asleep. In fact, our body temperature needs to drop by about one to three degrees in order to fall asleep and then there are further decreases in our body temperature that allow us to get into the deepest stages of sleep and the so-called rapid eye movement sleep, all the aspects of sleep that really restore our brain and body. And then waking up actually involves a heating up of core body temperature. By sleeping on an Eight Sleep mattress cover, you're able to control the temperature of your sleeping environment precisely. I've been sleeping on an Eight Sleep mattress cover for many months now and I can tell you it has completely changed my sleep. I thought I was sleeping pretty well before and now, frankly, I don't even want to travel because I don't want to be away from my Eight Sleep. I can't wait until hotels and Airbnbs include Eight Sleep. If you want to try Eight Sleep, you can go to eightsleep.com/huberman and check out their new Pod 3 Cover to save \$250 off as a special Labor Day offer now through September 11th. Eight Sleep

currently ships within the USA, Canada, and the United Kingdom.

00:09:37 The "Arrow Model" of Focus: Epinephrine, Acetylcholine & Dopamine

Again, that's eightsleep.com/huberman to save \$250 off an Eight Sleep cover now through September 11th. Okay, let's talk about focus and concentration and how you can improve your focus and concentration using science based protocols. Now because today's episode is mainly focused on tools and not so much the underlying mechanisms, I'm mainly going to focus on what to do and when and how to do it. But I just want to take about three minutes and briefly describe a model, that is a visual image that you can put in your mind, that will help you incorporate the tools that I'll provide and that generally will help you understand at a mechanistic level how focus and concentration work. So what I want you to imagine is an arrow. And an arrow of course, has an arrowhead and it has the shaft of that arrow. And in the context of the neuroscience of focus and concentration, the neurochemical system that really represents the shaft of that arrow, right, the straight line is epinephrine, also called adrenaline. And today, I'll refer to adrenaline and epinephrine interchangeably. Turns out that epinephrine/adrenaline are released within your brain from a little location, a little cluster of neurons called locus coeruleus, but you do not need to remember that name, and from your body from the adrenal glands. And the release of epinephrine from those two locations overall increases energy, it increases alertness. It does not alone increase focus, okay? So the reason I've assigned epinephrine, adrenaline as the shaft of the arrow is that if focus is the arrow, there is no focus without epinephrine. So things, whether or not they're behavioral or psychological or supplements or drugs that increase epinephrine allow focus to occur, they are necessary for focus, but they are not sufficient for focus, that is they are required but they are not enough to create focus. So we're going to need epinephrine in the equation. Without epinephrine, there is no focus or concentration. Now the arrowhead on this metaphorical arrowhead that represents focus and concentration is going to be represented or related to the mechanisms of acetylcholine, a different neurochemical that also exists in the brain and body. In fact, in the body, it's responsible for the contraction and movement of your muscles. But today, we're talking about acetylcholine not in that context, but rather in the context of its release within the brain. Acetylcholine is released from a couple of different locations in the brain and the best way to think about it is it's like a spotlight. It highlights specific

neurons, nerve cells that should be active, or more active I should say, than the other neurons in the environment. So the reason I've assigned the arrowhead to acetylcholine and acetylcholine to the arrowhead is that if you have an arrow with a very big arrowhead that's really broad, really broad, imagine a mile wide arrowhead, that's not very focused on any one location, it's not really pointing to any one location, is it? But with a narrow, really tightly focused arrowhead, well, that's focused on one location. So we have alertness, epinephrine, and then we have the actual direction in which our concentration and focus is placed, and that's, at least in this mental model I'm creating, acetylcholine. And then in order to have ongoing focus, we need another neurochemical. And it turns out that that third neurochemical is dopamine, a molecule often associated with pleasure and reward, but it's really the molecule of motivation. So here, I want you to imagine in your mind, an arrow with an arrowhead, think acetylcholine in the arrowhead, a shaft or a line behind that arrowhead, which is epinephrine also called adrenaline. And then behind it, a sort of an engine that keeps that focus moving forward, right because we don't just want to be focused for a moment, we want to be able to focus for 10 minutes or for an hour or maybe even for two hours. Turns out there's an optimal duration to focus, I'll teach you that in just a little bit, but these three neurochemicals together, acetylcholine, epinephrine and dopamine really allow you to get focused, to focus very precisely, and in fact, increasingly precisely over time to really narrow and narrow and narrow your focus progressively within a single about of focus and to continue to do that and to be able to do that repeatedly whenever you want. So here, I'm purely talking in metaphor and in models and mental models of arrows, but in a moment or two, I'll start transitioning to discussing tools in which I'll talk about increasing dopamine and acetylcholine or increasing epinephrine and dopamine in various combinations with various approaches. And what I'd like you to conceptualize is how those are contributing to creating a very narrowly pointed arrow that has the capacity to continue moving forward over and over so that you can focus as sharply and as long as you like. And of course, for those of you that want to get really down in the weeds of how dopamine works, we have an entire episode about dopamine motivation and drive that really gets into neurotransmitter release and dopamine baselines and thresholds and all of that sort of thing. We also have episodes on focus, much longer episodes, I should say on focus that incorporate a lot of the biology of acetylcholine. It turns out acetylcholine is also involved in neuroplasticity, et cetera, and epinephrine of course, relates to stress and our capacity to deal with and buffer stress and on and on. Those

episodes are all available to you in their long form at hubermanlab.com, you can find them very easily. They are all timestamped so you can navigate to the particular topics most of interest to you. I mention this all not as a diversion from what we want to cover today, but I know that some of you are hungry for a lot more mechanism, but today's episode is really mainly focused on the tools, I will of course touch on mechanism, but if you really want to do the deep dive on mechanism,

00:15:15 Modulation vs. Mediation, Importance of Sleep

go to hubermanlab.com and you'll have more than you ever could want about those mechanisms. Let's jump into the tools for concentration and focus. If you want to think about tools of any kind to modify your biology or physiology in any way, whether or not it's for cognitive function or you want to get better at exercising, or you want to build muscle, or you want to improve your hormones, you need to think and understand tools in the context of modulation and mediation. What do I mean by that? Well, it's quite simple really. Mediation is how specific types of chemicals and cells and circuits and organs control very specific things in your brain and body whereas modulation is the ability of chemicals and cells and circuits to adjust how different things change, how different things work in your brain and body, but to do it more broadly. What do I mean by this? Let me give an example. For instance, I'm going to tell you now that one of the most important things to build and maintain your focus and concentration is to optimize your sleeping behavior, that is to get enough quality sleep I would say 80% of the nights of your life. Not everyone can get optimal sleep 100% of the nights of their life, nobody, truly nobody achieves that. However, sleep has been shown to relate to cognitive performance, physical performance, hormone output, and so many other things, including immune system function. What we can reliably say is that sleep modulates just about every process in your brain and body. So you have to get great sleep. There is simply no tool that's going to allow you to overcome chronic sleep deprivation and allow you to remain focused, no pill, no device, no supplement, no protocol whatsoever. There are tools to overcome one night or maybe two nights of sleep deprivation and we'll talk about those, but at a fundamental level, we need to do the things that modulate our focus and attention in powerful ways and sleep really is that thing. So we've done two episodes, one called "Master Your Sleep" and the other episode is "Perfect Your Sleep." The "Perfect Your Sleep" is a little bit more like this episode, more focused on protocols.

"Master Your Sleep" includes protocols and mechanism. Again, you can find those at hubermanlab.com. We also have a sleep toolkit, a distilled list of things to do in order to optimize your sleep. I highly recommend that you download that. You can go to hubermanlab.com, go to the Neural Network Newsletter, it is listed there. If you want you can sign up for the newsletter, but you don't have to, you can simply download the PDF of that toolkit for zero cost. Why do I say sleep modulates focus and attention? Well, I'll give an analogy. If right now someone pulled a fire alarm in this building or if we had a fire in this building, my attention would drift, it would not be on recording this podcast, it would be on something else. But would I say that the fire alarm mediates attention? I mean fire alarms are not really involved in attention. No, rather they modulate my attention. The noise in the room modulates my attention.

00:18:11 Tool: Binaural Beats to Improve Concentration

That's quite a bit different than a tool that I'll provide later and I'll just give you a little hint of now, in fact, I'll give it to you now, which is that 40 HZ binaural beats have been shown in a number of peer reviewed studies to increase focus and concentration. And if you'd like to access 40 HZ binaural beats in order to improve your focus and concentration, you can do that, you can actually get it at zero cost. You can go into the app store, for instance, the Apple App Store, this is also available for Android phone, there's an app called BrainWave, and you can go there, you can dial in 40 HZ and it'll play these binaural beats. It's been shown in multiple quality peer reviewed studies that playing a pattern of sound waves to one ear, do, do, do, do, do, and the other ear, which is slightly offset in frequency, meaning not quite the same frequencies, so more like do, do, do, do, do, that that combination of frequencies played to the different ears, actually get integrated within deep brain centers and can increase focus and concentration in part by increasing levels of the neurochemical dopamine and acetylcholine, which we talked about a little bit earlier in this arrow model of focus. So we'll provide a link to that app, I don't have any relationship to that app I should mention, but it's an excellent one, it's one that I've used for many years. There are also additional functions within the app, such as for sleep and for other things, but the 40 HZ, 4-0-h-z is the way it reads out, 40 HZ stimulation has been shown to improve focus and concentration. Here is my recommendation and the way that I use it. I would not use 40 HZ binaural beats every time I'm doing a about of work. What I tend to do is use it for about five minutes prior to

that work and then turn it off and then do the work and I'll talk about other tools to use during that work, whether or not it's reading or math or even just emailing or something where I require a bunch of focus for a while. However, there are times in which I'm in an area or I'm in a state of mind where I'm feeling very distractable and then I'll keep the 40 HZ binaural beats on the entire time I'm doing that about of cognitive work. I'll also sometimes use the 40 HZ binaural beats prior to a workout, in particular weight workouts, where I really want to be able to focus on and contract specific muscles. So it's a very useful tool, again, supported by quality peer reviewed science, zero cost, available out there not just in the BrainWave app but in multiple apps. I think many of you will benefit from it. Some of you might not experience it immediately as a total dropping into a tunnel of focus in the same way that you might with say the sorts of neurochemicals that we'll talk about later, like Alpha-GPC and some of these other things that change neurochemicals directly, but nonetheless 40 HZ binaural beats are a very powerful tool, again, zero cost non-pharmacologic tool that tap into your own endogenous, meaning within you or exists within you physiology in order to increase acetylcholine

00:20:54 Tool: White, Brown & Pink Noise, Transition to Focused State

and some other neurochemicals and they have been shown to work quite well. Okay so assuming that you are sleeping well 80% of the nights of your life or at least working on the various protocols and tools to sleep well and sufficiently long 80% of the nights of your life, and you are interested in additional tools that are sound based in order to improve your ability to concentrate and focus, there are quality peer reviewed studies supporting the idea that white noise or pink noise, and believe it or not, there is something called pink noise, it has to do with the specific frequencies of sound that are in the noise, well white noise and pink noise have been shown to not improve concentration per se, but to improve people's ability to transition into concentrated states. So I don't tend to use white noise and pink noise while I work, but I know a number of people that do. I know people that also use what's called brown noise. The folks I know from the engineering and computer science side get really into these details of white noise, pink noise, brown noise. You can find white noise, pink noise or brown noise and listen to it through headphones or in the room. There is indeed some data to support the fact that white noise, and to some extent, pink noise and brown noise can

support the release of particular neurochemicals, but more data showing that they can amplify the activity of neurons in the so-called prefrontal cortex, this front area, sort of the bumper behind your forehead, that is directly related to your ability to direct your own focus and remain focused on certain things. So you have the option of either using binaural beats before, but not during your work, that is 40 HZ binaural beats, or 40 HZ binaural beats throughout your attempt to focus. You also have the option of not using binaural beats, but using white noise, pink noise or brown noise. Again, there are a lot of zero cost apps, you can find also white noise, pink noise and brown noise on YouTube. Again, these are tools that really have been shown over and over in humans

00:22:55 Warm-Up for Cognitive Work, Refocusing Attention & Neuroplasticity

to allow people to focus with more depth and to decrease the transition time into focus. This is a really key point. A lot of people are challenged with getting into a mode of focus. None of us, however, should be expected to just sit down and drop directly into a state of focus. I think that's completely an unfair request of ourselves. I mean, for instance, you wouldn't expect yourself to go out on the track or go out for a run and not warm up. You might jog for a few minutes or even walk before you would jog and then jog before you would run, right, I would hope you would do that. And if you're doing resistance training, I doubt that you go over and load up the bar or the machine with the maximum amount of weight that you can move and then just drop right into that, you always do a warmup. And I think it's very important to understand mental work, focus and concentration as requiring that warmup. What is that warmup? Well, you know what that warmup is. That warmup is the ramping up or the increase of epinephrine, adrenaline, acetylcholine, and dopamine. Right, the way that neurochemicals work is we don't just get to flip switches in our brain because we decide to, that's a fantasy. That's sort of the "Limitless" movie or movies and ideas that suddenly you're going to flip a switch on your arm and all of a sudden you're going to be in a laser focus, that is just not the way that your nervous system works. There's a gradual dropping into any state, whether or not that state is sleep, right, you go from shallow sleep to deep sleep and then out eventually. Focus too, you go from shallow focus to increasingly deep focus. That is, in our metaphor of the arrow, it's very broad, it's pointed at a lot of things. And over time as we drop into focus, that arrow is narrowing and narrowing and narrowing. In fact, probably better to think about it narrowing and then sometimes oscillating and

getting wider again. We might hear something down the hallway or more typically our phone will buzz or we'll think, oh, I wonder what so and so is doing or I had to contact them about something. Your focus is dynamic, it is not what we call a step function. It's not like you go from unfocused to focused and then you drop into your maximal focus. By understanding that it's dynamic, by understanding that you are going to be continually going in and out of progressively but varying levels of focus, you will greatly release the pressure on yourself to feel focused all the time when you want to be. This is very key. People who are very good at focusing understand this and understand that they can't expect themselves to just immediately focus and then snap into or out of focus. Okay so be patient with yourself and also understand that focus is an ability, that you can improve your ability to focus by engaging the neural circuits responsible for focus repeatedly over time through so-called neuroplasticity, the ability of your nervous system to change in response to experience. And that has a couple of different components, but put very simply, what we repeat gets etched into our nervous system and becomes easier over time. And the more emotionally important or vital something feels to us, the more likely it is to trigger neuroplasticity. We're going to talk a little bit more about how to increase neural circuits for focus later, but right now, what you have in hand is the key importance of sleep and I again will direct you to hubermanlab.com and the Neural Network Newsletter to really work on optimizing your sleep. We've also got two auditory sound based tools for improving focus, there's 40 HZ binaural beats used before or during bouts of focus and concentration. And if you don't like those, or even if you do,

00:26:14 Tool: Ultradian Cycles: Warm-Up, Maintaining Focus & Deliberate Defocusing

you might alternate them with or occasionally use white noise, pink noise or brown noise, also readily available at zero cost. A question I often get is how long should I try to focus? Well, the research literature point to the key importance of so-called ultradian cycles. You've all probably heard of circadian cycles or circadian biology, circa, the day, circadian, is about 24 hour cycle. Well, our brain and body operate within that day or within each and every day I should say with 90 minute ultradian cycles. So my suggestion would be anytime you're going to sit down and try and focus or you're going to try and do a focused about of physical exercise or skill learning or musical learning, or maybe you're even just having a conversation, maybe you're a therapist or you're attending therapy or a class, how long should it be? And the ideal duration is about 90

minutes, not exactly 90 minutes, but we can reliably say 90 minutes or less, okay, it doesn't have to be the full 90 minutes. But trying to push yourself to be able to drop into two hours of focus or three hours of focus, while possible is not really in line with what we know about the underlying biology. Everything from our sleep states or the different stages of sleep and our waking states is divided into these 90 minute cycles or so-called ultradian cycles. So what I like to do is set a timer for 90 minutes. I acknowledge and accept the fact that under most conditions unless I'm really pressed for a deadline and I'm optimally caffeinated, et cetera, the first five to 10 minutes of that 90 minutes are a transition time, it's like the warm up for focus, but I do include it in that 90 minutes. And then I really try and drop into doing focused mental work or learning of some sort, again, this could be physical as well, motor skill learning or anything, we're running or lifting weights, et cetera, and really try and drop into that across the full 90 minutes, again accepting the fact, okay it's not just an idea, the fact that occasionally our focus will flicker, it will jump out of focus, and then a big part of being able to focus is to go back to focusing. The way I'd like you to conceptualize this perhaps is that arrowhead suddenly getting very, very broad, that you're focusing on many things or that arrow shifts to a different location in the room. The key is to be able to shift it back and to narrow it once again and that's an active process, so much so that it requires a lot of metabolic energy, your brain is the chief consumer of metabolic energy. The calories that you consume, the so-called basal metabolic rate, most of that isn't related to movement or heartbeat or breathing, it's related to brain function. Your brain is a glutton with respect to caloric need. So understand that at the end of 90 minutes or maybe even after 45 minutes, you might feel rather tired or even exhausted. And it's very important that after a about of focus that you take at least 10 minutes and ideally as long as 30 minutes and go through what I call deliberate defocus. You really want to focus on somewhat menial tasks or things that really don't require a ton of your concentration. This is starting to become a little bit of a movement out there in the kind of pop psychology and optimization world, this idea of not looking at your phone as you walk down the hall to the bathroom, certainly not looking at your phone in the bathroom. And I should mention, by the way, this is a particular annoyance of mine, have you noticed that wait times for restrooms in public places has increased substantially in the last 10 years? The reason for that is not digestive, okay, it's not the gut microbiome, I mean it might be the gut microbiome, but chances are it's because people are on their phones in the bathroom. So you're doing yourself and everybody else a favor by staying off your phone in the restroom, staying

off your phone while walking down the hall. Try and give yourself some time to deliberately decompress, to let your mental states idle, to not be focused on any one thing. That period of idling is essential for your ability to focus, much in the same way that rest between sets of resistance training or rest between exercise is vital to being able to focus and perform during the actual sets or during the actual bouts of running or cycling or whatever your particular form of exercise might be. So deliberate decompression is key. And I know this is hard because we're all being drawn in by the incredible rich array of sensory information available on our phones and other devices, but I can't emphasize this enough, our ability to focus is not just related to what happens during the entry and movement through those focused bouts but after those focused bouts. We really need to deliberately decompress. And of course, the ultimate decompress, the time in which we are not directing our thinking interaction is during sleep. And so it's no wonder, or I should say it holds together logically, that that deep, long lasting duration of not controlling where our mind is at is in fact the ultimate form of restoration, even if we have very intense dreams. So take that period after each 90 minute or less focus about, right, remember those focus bouts don't have to be full 90 minutes, let's say you do 45 minutes of work, you're just done with it, set it down and go do something for maybe five, 10, maybe even 30 minutes that is functional for your day, right, not just walking around in circles or staring up at the sky although if you can do that, do that, but most of us have other things to do, but do things that are rather automatic or reflexive for you, and try not to do any focused reading, try not to bring your vision into a tight location, such as your phone and try and deliberately decompress, because that will allow you

00:31:22 How Many Daily Ultradian Cycles Can One Perform?

to drop into intense spouts of focus again repeatedly and repeatedly throughout the day. I'm often asked how many ultradian cycles one can perform throughout the day? That depends on how well you've slept, how well you are nourished, which we'll talk about in a moment, and how well trained up your focus capacity is. And here's the paradox, if you are very trained at focusing, if you're very good at dropping into focus, you're actually going to need more deliberate decompression and defocus and I recommend only doing about two, maybe three deep work sessions per day. So not one 90 minute session than expecting yourself to do to another one and another one, another one, but rather one

deep work 90 minute session, and maybe another in the afternoon. A lot of people get surprised by this and say, "Wait, how many people can afford to just work three hours a day?" I'm not saying just work three hours a day. I'm really talking about the hard mental work. And again, somewhat paradoxically, the more you can concentrate, the more deeply you can concentrate, the fewer deep work concentration bouts you can actually perform each day. This makes sense, however, if you think about it in the context of say resistance training. If you are stronger and stronger in the gym, or you're an endurance athlete and you can run ultra-marathons, 100 miles or so, you are essentially cutting a deeper cut into your recovery capacity than somebody who's not very skilled at those things or can't perform as much intense work. So the intensity of the work scales directly with how long you need to rest after that work. I at this stage of my life am pretty good at dropping into and maintaining focused bouts of concentration provided the landscape of my life is right, you know, I don't have some burning stressful thing that's essential or an emergency that I'm tending to and that I put my phone away or turn it off, I can do three 90 minute focus bouts per day, but that's about it. And then in between those focus bouts, I'm doing other things that require less focus. Some of you may be able to perform four. What I highly recommend is that you try doing at least one, that is one 90 minute or less about of focused concentrated work per day, and yes, that means the weekends too. And on the weekends, I like to read a book with my phone nowhere in sight, not on a device, that's what I do or I'll listen to an audiobook sometimes while taking a walk, but really concentrating on what I'm trying to learn, what I'm hearing and what I'm seeing. So again, a daily 90 minute about is one to start with and I would say after about four weeks of that, if you're able to stay concentrated and work through the agitation, then I would consider increasing the number of focus bouts. Again, this is not to say that you should go to your teacher or your PhD advisor or your parent or your friends and say, "Listen, I can't really concentrate or think about anything for more than 90 minutes per day." That's not what I'm saying. These are deep focus bouts. These are bouts of work, or I should say mental work or physical work where you're really forcing yourself to focus and refocus, to sharpen the head of that arrowhead, to redirect it to what you're trying to concentrate on, and it is indeed hard work.

00:34:14 AG1 (Athletic Greens)

I would even think about it more or less like a workout of any kind. Before we continue

with today's discussion, we're going to take a brief pause to acknowledge our sponsor Athletic Greens, also called AG1. I started taking Athletic Greens way back in 2012 so I'm delighted that they've been a sponsor of this podcast. Athletic Greens contains vitamins, minerals, probiotics, digestive enzymes, and adaptogens, so it's got a lot of things in there and that's actually the reason I started taking it and the reason I still take it once or twice a day. It essentially covers all of my nutritional bases and the probiotics in particular are important to me because of the critical importance of what's called the gut brain axis, that is neurons and other cell types in the gut, in the digestive tract that communicate with the brain and the brain back to the digestive tract in order to control things like mood, immune function, hormone function, and on and on. Whenever somebody has asked me, what's the one supplement they should take, I always answer Athletic Greens. I gave that answer long before I ever had this podcast and it's the answer I still give now for all the reasons that I detailed just a moment ago. If you'd like to try Athletic Greens, you can go to athleticgreens.com/huberman to claim a special offer. They'll give you five free travel packs that make it really easy to mix up Athletic Greens while you're on the road, plus a year supply of vitamin D3+K2, which are also very important for a huge number of bodily factors and brain factors

00:35:35 Virtusan: Mental & Physical Health Journeys

that impact your immediate and long-term health. Again, that's athleticgreens.com/huberman to claim that special offer. I'd like to call your attention to a new and extremely useful tool for learning and applying science based protocols for mental health, physical health and performance. It's called Virtusan, v-i-r-t-u-s-a-n, and it's an app. And inside the app, you'll find what are called journeys. Each journey is aimed at a specific goal, such as improving your sleep or tracking your sleep or improving your ability to focus and concentrate or improving your nutrition or specific exercise programs. The Virtusan app makes a lot of the protocols that you've seen here on the Huberman Lab Podcast and elsewhere very easy to understand and access and practice. And in fact, it tracks your progress with each of these protocols. I and several other researchers have been directly involved in developing the specific journeys and protocols that you'll find within the Virtusan app. In fact, a lot of it involves direct video tutorials from me and others that you'll recognize from social media and from podcasts. Everything that you'll find within the Virtusan app is geared towards giving you the latest

science in simple, straightforward protocols to allow you to improve your mental health, physical health and performance. If you want check it out, you can go to the App Store under Virtusan, again, that's spelled v-i-r-t-u-s-a-n,

00:36:52 Tool: Fasted vs. Fed States & Focus, Prevent an Afternoon Crash, Ketosis

or you can go to virtusan.com/huberman. Again, that's virtusan.com/huberman. I mentioned the topic of nutrition a little bit ago, and of course, nutrition is a complicated topic. In fact, one of the quickest ways to get yourself into a battle online is to say something definitive about nutrition. I just want to clearly state my stance about nutrition. I fully support and applaud those of you that are vegans for whatever reason, those of you that are pure carnivore for whatever reason, and those of you that are omnivores for whatever reason. I happen to be an omnivore. My goal is always to eat high quality, minimally or non-processed foods and to eat things in moderation. So I do eat some meat from sustainable sources or from organic sources, I eat some starches and I eat vegetables and I eat fruits, I try not to eat sugars and I don't really like highly processed foods at this point in my life. That's me, that's what I do, but I'm certainly not dictating what people should eat. I know certain people are ketogenic, and I can say that for people who achieve ketosis and can get into ketosis, yes indeed, there is a mental state associated with ketosis that will allow your brain to function and to think really clearly that many people find very attractive and keep them going back over and over again to a ketogenic diet. I'm somebody who for instance has not been in ketosis many times in my life, at least not deliberately so, but I actually will ingest liquid ketones from time to time because of the further cognitive enhancement and physical enhancement that I experience on top of nutrition that does include some carbohydrates. So there are a lot of different ways to approach all this, whether or not you're a vegan, omnivore, vegetarian, carnivore, et cetera, the point is this, your ability to focus, and in fact, your ability of neurons to encode specific information in your environment, that is to represent what's out there in the world, is actually related to your blood glucose level. Now here I'm setting aside the discussion of ketosis and ketogenic diets for the moment, but there's a beautiful study that was published in Neuron not long ago that showed that the tuning, that is the precision with which neurons in the brain will represent things in our environment is actually much greater when there is sufficient glucose in the brain. Translated into English, this means that when we are fasted or when our blood glucose

is very low, we aren't able to perceive and think about things as clearly. Now there's a twist to this, however. Many people who practice intermittent fasting, and I should say I practice a sort of pseudo intermittent fasting, I generally eat my meals between the hours of 11:00 AM and 8:00 PM although sometimes there's some wiggle around that, occasionally have an early breakfast, I'm not super rigid about it, but I know there are a number of people who are doing longer fasts or they're eating in a six hour window. We did an entire episode about fasting, you can again find that at hubermanlab.com, we'll likely have Satchin Panda, who's an expert in intermittent fasting, on the podcast.

Intermittent fasting has a lot of different potential benefits. For some people, it's a convenient way to restrict their calories. For other people, it's a convenient way to avoid eating, that is it's easier to not eat than to eat a small portion so they opt for intermittent fasting and so on and so forth. But one of the things that you hear very often is that some people like being fasted because they like the clarity of mind that it provides.

Here's the situation. Neurons, unless you're in a ketogenic diet, really thrive on glucose, they love glucose. And as I mentioned before, your ability to think and perceive things is actually enhanced by having sufficient glucose in your bloodstream. So why would it be that some people experience a heightened state of mental clarity when they are fasted? I've certainly experienced that before. Well, I should say that provided you're well hydrated enough and you have enough electrolytes in your system, what tends to happen is that when you ingest food, there's a shift in your nervous system towards so-called parasympathetic mode, that is the more relaxed, you've probably heard it as rest and digest, although it does other things, the more relaxed mode that can indeed make us very sleepy. If we have too many carbohydrates, it actually can make us quite sleepy. However, if we have any food, if we have enough of it, that is if our gut is full, it diverts blood to our gut and we become sleepy and we can't focus as well. So a lot of people really like fasting and the state of being fasted for focus and concentration because they don't have as much of that parasympathetic activation, they're just not as sleepy. And in fact, under those conditions, half as much caffeine will give you just as much lift as twice as much caffeine will give you on a full belly of pasta and that's just the way that caffeine interacts with blood glucose. So what I'd like you to imagine is if you had a measure of focus from zero to 10, these are arbitrary units, 10 being maximally focused and zero being not focused at all, imagine a U-shaped function, right, where if you're very fasted, you're going to have high degree of focus and concentration, but then if you ingest some food and your belly is full, your focus and concentration is reduced. But having enough

blood glucose and maybe even elevated blood glucose will increase cognitive function. So there are two ends of the spectrum. On one end of the spectrum, blood glucose is relatively low and you're fasted and you can think and behave in a very concentrated way and on the other end of the spectrum, you have a lot of blood glucose, or I should say, sufficient blood glucose, you never want your blood glucose to be too high, and that allows your neurons to encode and perceive and basically allow you to think really clearly. So you sort of have to pick your condition. What do you want for your bouts of focus and concentration? I actually do both. So what I do is, as I mentioned before, I eat my meal sometime around 11:00 AM, my first meal typically unless I'm very hungry when I wake up. And so I will do my workout and one about of focused work. I always think of this as my hard work early in the day and I do that fasted, I'll be consuming water with electrolytes, maybe LMNT or other electrolytes, maybe some caffeine as well in the form of yerba mate or coffee, that's my first focus about of 90 minutes or less, that is essentially done fasted and then I'll eat and then I do notice after I eat, I actually have a diminished capacity to focus. But then again in the afternoon, I will do another 90 minute about of focus, and I'll talk about some of the tools I use to make sure that that about of focus is optimal for getting the most amount of focused work done, whether or not it's mental work or physical work, although I tend to do my physical work early in the day and my mental work both early and late in the day. So to make this very simple or as simple as I can for you being fasted is great for focus and concentration provided you're not thinking about food the entire time and being fed is terrific for focus and concentration, it actually can improve neuronal function provided that you didn't eat too much food. So one way to manage this is if you're going to have a lunch, to make sure that you don't stuff yourself at lunch, that you're not overeating and to not get quite so full that you put your nervous system into this parasympathetic mode and make it hard to focus in the afternoon. I know a lot of people experience a dip or even a crash in energy in the afternoon that make it really hard to focus. For that reason, I'll just remind people of a tool I've talked about many times before, which is based on the biology of adenosine and caffeine, et cetera, which is to delay your first caffeine intake to 90 to 120 minutes after waking up. I know that can be painful for certain people. I violate that rule, when I'm working out very early in the morning. I'll drink my caffeine before my workout which often occurs within 30 to 60 minutes of waking. But in general, unless I'm working out very early, I will ingest my caffeine 90 to 120 minutes after I wake up. So again, I want to emphasize that if you hear somebody out there say being fasted is optimal for focus and

concentration. Well, that is true in one context and perhaps ideal for a certain part of the day. And other people will say, no, neurons run on glucose, you need glucose in your bloodstream in order to get those neurons to be tuned, that is to respond with electrical activity in the optimal way when you're reading something or when you're trying to perform exercise. Well, that's also true. And of course, you can incorporate both. I, in fact as I just described, incorporate both fasted states and fed states in order to optimize my concentration and focus. And as a brief note about ketosis, for those of you that actually managed to transition into ketosis and are maintaining a ketogenic state, that, as I mentioned earlier, can enhance brain function, concentration and focus because of the way in which ketones can be used as a so-called optimal fuel for neurons. The ketogenic diet was originally designed, if you will, for epilepsy, it has a whole relationship to epilepsy and controlling epileptic seizures, and it can in fact allow people to achieve focus, concentrated brain states. So in the future, I'll do an episode about ketosis and be sure to circle back on how to optimize ketosis for focus and concentration. Although I have to believe that most of the people listening to this are probably not in ketosis or following a ketogenic diet so that's why I mainly focused on fasted states and fed states. And just to make sure that I'm thorough, a fasted state to me would be a state in which you haven't ingested any calories, but may have ingested caffeine or maybe even a small amount of artificial sweetener or something like that, but really haven't ingested any significant number of calories in the previous four to eight or maybe even 12 hours. And again, there's tremendous variation here, depending on how long people have fasted, whether or not we're talking about the state right after people wake up, et cetera. Again, if you're interested in intermittent fasting, both for the sake of mental

00:45:52 Tool: Foods to Improve Focus & Regulating Food Volume

and physical health and performance, check out our episode on fasting at hubermanlab.com. I also want to touch back on this idea of which foods can increase focus. You know, in the episode on ADHD that I did, I touched on this quite a bit as it relates to elimination diets. There's a whole industry and a ton of interest for obvious reasons into what sorts of things kids and adults should and shouldn't eat in order to reduce symptoms of ADHD. I think that the sum total of those data point to the fact that reducing simple sugar intake and certainly highly processed foods, so ice cream, candy, chips, et cetera, those sorts of things, really does seem to improve symptoms of ADHD

in both children and adults. But once you move past that and you start to say, well, which foods can improve concentration and focus? Well, foods that for instance include a lot of tyrosine, which is a precursor to dopamine, and now you know why dopamine is important in this context, are certainly going to increase concentration and focus. So things like Parmesan cheese, certain meats, certain nuts, you can look up which foods contain high amounts of tyrosine. There are also some fruits and vegetables that include high amounts of tyrosine, but to be quite direct, it doesn't matter whether or not you're ingesting foods that are rich in the precursor amino acids to dopamine, acetylcholine, et cetera, if you are consuming large amounts of those foods. That is one can look and see for instance, that a steak includes a lot of the precursors to acetylcholine. It has amino acid precursors to dopamine as well and there are other foods that will do that as well, but if I were to ingest say two ribeye steaks, that's a lot of meat and it will direct a lot of blood to my gut and it will cause me to be sleepy and that will create challenges of me being able to achieve states of focus and concentration. So the simple way to put this is if you eat too much or you eat a very large volume of food, you are going to diminish your focus and concentration. The key is to eat enough that you're nourished for the certain activities, mental and physical that you need to perform,

00:47:53 Tool: Caffeine & Focused Work, Dopamine Efficacy, Alertness

but if you're eating large meals, you are going to diminish your concentration and focus period. I know many people are curious as to whether or not caffeine can improve focus and concentration, and indeed it can. There is an immense amount of data supporting the idea that caffeine, provided its consumed in the appropriate dosages, can improve mental performance and physical performance, and it largely does that through improvements in focus and concentration. The dosage of caffeine of course, is going to depend on how caffeine adapted you are, how much caffeine tolerance you have. And that is going to vary tremendously depending on whether or not you ingest that caffeine with or without food, as I mentioned earlier. But there is a kind of general range in which we can talk about caffeine as being useful for focus and concentration. And the range is basically from 100 milligrams to 400 milligrams. I want to caution everybody out there, if you're somebody who suffers from anxiety or panic attacks, and you're not used to ingesting caffeine and you run out and ingest 400 milligrams of caffeine in the form of espresso or yerba mate or an energy drink or in pill form, that is going to be very

uncomfortable for you, you're going to be sweating profusely, your heart rate is going to increase, you're going to be quite panicked in fact or at least anxious. So be cautious with your use and adopting of caffeine if you're not already caffeine adapted, but most people do quite well to ingest 100 to 200 milligrams of caffeine prior to doing some focused work. And again, I recommend delaying your caffeine intake to 90 to 120 minutes after waking, unless you're using that caffeine to really jolt your system before a workout. Caffeine can of course be ingested in various forms, even pill form, but most people ingest it in the form of coffee or my particular favorite way to ingest caffeine is yerba mate. It is important and I should note that you should actively avoid the smoked versions of yerba mate as they contain a lot of carcinogenic, cancer promoting compounds. There's some great yerba mate brands out there. The most cost effective way to consume it would be to use the loose leaf tea and to pour water over that. There's one particular brand that I like, I don't have any affiliation to them whatsoever, but I've been using it for years, it's Anna Park. It's an organic brand that is sold, I buy mine on Amazon, you can find it elsewhere on the internet as well. Again, I don't have any affiliation to them, it's just very cost effective, very clean, it doesn't have the smoked flavor, at least the one that I buy is not the smoked variety so none of the carcinogenic compounds are in there at least that I'm aware of and I like the way it tastes and it provides a very even lift and stimulant that I think certainly works for me and that a number of people I know that I have suggested to also enjoy. Yerba mate or caffeine also have other additional benefits, in particular, the caffeine in yerba mate and coffee and other sources of caffeine are known to increase the density and efficacy, that is the number and the function of dopamine receptors, and this has been shown in humans several times. So by ingesting caffeine pretty regularly, you're actually increasing the ability of dopamine to have this effect of increasing motivation and drive. I tend to ingest caffeine only early in the day, I tend to cut off my caffeine intake somewhere around one or 2:00 PM to ensure that I can get into a good night's sleep, but I realize that there are people out there that ingest caffeine as late as two or three in the afternoon and can still sleep fine. I will caution those of you that think that you can drink caffeine in the evening or nighttime and still fall asleep. All of the research points to the fact that the architecture of your sleep and the depth of your sleep is disrupted. Even if you're able to fall and stay asleep, the sleep you're getting is simply not as good as the sleep you would get if you were to shut off your caffeine intake at least eight hours before bedtime, and ideally more like 10 or even 12 hours before bedtime. But of course, there are practical

constraints as well. Okay so caffeine is increasing dopamine's function by changing the number and efficacy of dopamine receptors, but of course, it also increases our wakefulness, our alertness, and that is largely through the neurochemical systems related to adenosine, which is a molecule that builds up in our brain and body the longer we are awake, it's part of the sleepiness system if you will, it makes us feel fatigued or tired, and caffeine also operates on the epinephrine, the adrenaline system. In fact, if we ingest too much caffeine, we'll sometimes get the jitters. Those jitters are really the sympathetic, as it's called, nervous system's bias toward movement, and our pupils will dilate, they actually get broader. Now somewhat paradoxically, when our pupils get bigger, the pupils of our eyes that is, our visual world actually narrows, it becomes more tunnel-like. A lot of people don't realize this. When our pupils are really small, that means we are relaxed. So if you ever see someone with really tiny or pin size pupils, they're very relaxed. If their pupils are very big, they're very dilated, well then they are very amped up, they are very, very alert. Caffeine increases alertness by increasing epinephrine, adrenaline release both in the brain and within the body.

00:52:55 Tool: Stress & Improved Concentration

And so that's another way that it facilitates focus and concentration. Now there are other ways to increase epinephrine in the brain and body besides caffeine or other stimulants, and in fact, that has been studied. There's an excellent study that was carried out not that long ago on how stress itself can increase our ability to focus and concentrate, that's right how stress itself can increase focus and concentration. You know, most people think of stress as impairing our ability to focus, but that's actually not true. When we are stressed, it involves the deployment, the release of adrenaline, epinephrine, and that that adrenaline both changes our visual field, in other words, it narrows our vision to a more tunnel-like focus, that is it makes the arrow in our metaphor of the arrow more sharp, and it improves our concentration. And this makes sense given what we know about stress. When we're stressed, we tend to be stressed about a specific thing, we start anticipating or wondering or thinking about what's going to happen next? What led up to this? How is this going to impact me? How do I feel right now? It really narrows the context of our thinking and our behavior. So one of my favorite studies that really illustrates how stress can improve concentration and performance is one that was published not that long ago and I will provide a link to this in the show notes. It's a paper

published in the "Journal of Experimental Psychology" in 2020. The title of the paper is, not surprisingly, "Acute stress improves concentration performance", first author DeGroot, d-e-g-r-o-o-t-e. And this study involved taking a number of subjects and stressing them out or not prior to a cognitive or concentration task. And there are a lot of data in this paper, but I'm just going to hone in on one specific set of data. And I should mention as I go there, that they measured things like cortisol, a stress hormone, they measured anxiety, it was a quite thorough study. And what they found was that concentration performance improved manyfold, I should say, from, there was a greater than doubling of concentration and performance in the stress group. And stress in this context was provided using a standard way of inducing stress. What they basically do is they bring subjects into the laboratory and they have to either do something fairly mundane in the control group or they have to do a simulated job interview, an arithmetic task, and they're being evaluated as they're doing this. So this isn't intense psychosocial stress. They're not watching anything disturbing, they're not being traumatized in any kind of way. This is fairly low levels of stress that raised their levels of epinephrine, and we know this from this study, and their levels of cortisol, another stress hormone, modestly within their brain and blood. But that even modest increase in these stress hormones and their reported psychological levels of stress really enhanced their focus and concentration. This may come as surprising 'cause like many people think, gosh, stress really diminishes cognitive performance,

00:55:46 Tool: Deliberate Cold Exposure & Focus, Dopamine & Epinephrine

but that's absolutely wrong, stress improves cognitive performance. Now of course there are other ways to increase stress levels and to do that in healthy ways to improve concentration and performance and one of the best ways to do that because it's so sure fire and it's generally safe provided you do it safely is deliberate cold exposure. This is something I've talked about on the podcast before, but deliberate cold exposure can be achieved by getting into a cold shower for one to five minutes. If you're not used to it, you probably want to start with one minute, or you can get into an ice bath, and nowadays there are a number of different commercial sources of circulating cold water or if you have access to a body of cold water like a lake or a pool or an ocean. We know that getting into cold water or under cold water greatly increases epinephrine levels and dopamine levels in the brain and blood. There's a beautiful study that was published in

the European Journal of Physiology that showed that the increases in dopamine are massive, near doubling or more of dopamine levels that are very long lasting for hours, and epinephrine, and indeed cortisol levels are also increased, and in ways that support not just immune system function because they do that, and mood because it does that, but they can really improve concentration and focus. I touched on this a little bit in an episode about memory that there's an age old practice really dating back to medieval times of putting people into cold water right after they learn something in order to spike, to increase their epinephrine as a way to consolidate those memories. For the sake of today's discussion, if you are interested in ways to improve focus and concentration, you need to increase your epinephrine, your adrenaline levels. Cold water exposure is one of the most efficient ways to do that. This is not a biohack. I don't like the word hack, I know it's commonly used, but a hack is something where you're using one thing for a different purpose than it was originally intended for and here, I'm not referring to the shower or the cold bath, I'm referring to epinephrine. Epinephrine is a neurochemical that will place your vision into more of a tunnel mode, which will allow you to focus on cognitive work or physical work in a more specific way, you're not going to be as distractable, and it's very easy to achieve by getting into a cold shower or a cold body of water for a brief period of time. People always ask how long to get under or into cold water and how cold to make it. Here's the thing, it should be uncomfortably cold, but safe to stay in for one to five minutes. Okay so uncomfortably cold, you really want to get out, but safe to stay in, not so cold that it's going to give you a heart attack and not so warm that it's comfortable that it doesn't create that adrenaline release. Cold water exposure, I should say deliberate, cold water or non deliberate cold water exposure reliably increases epinephrine levels. It is incredibly useful as a tool for this, and it is in fact, zero cost or even negative zero cost. How could it be negative zero cost? Well, you can certainly save on your heating bill by taking a cold shower so that's one way. And for those of you that have access to devices or locations where you can get into cold water, you can submerge, well then that can work. For those of you that don't, maybe you take a cold bath, you get in up to your neck, that's going to be most efficient. For those of you that can't do that, you'll get under a cold shower. Again, it should be comfortably cold to the point where you want to get out, but that you can safely stay in for one to five minutes. How long should you do it before a workout? Well, if you get into really cold water, it's uncomfortably cold and get out after about three minutes, you're probably good to go, dry off and get to work. Some of you might think this is a little bit silly as a tool for focus

and concentration, but if you look at the data on epinephrine and how powerfully it can increase focus, I think you'd be very impressed. I mean it certainly can increase one's ability to attend to specific visual stimuli, so for reading or math work, et cetera, it's going to be very useful. And of course you don't want to make it so cold that you're shivering and chattering the whole time. And of course you could, if you like, combine this with 40 HZ binaural beats, there's no reason why you couldn't combine the two protocols. But the point here is that a lot of people would love to and I think ought to leverage the health promoting and powerful effects of increasing epinephrine on focusing concentration and running out and getting stressed by a life event or getting into an argument or something like that simply as a way to increase focus and concentration doesn't seem that adaptive to me. So deliberate cold exposure is a straightforward way to do that, it doesn't involve anyone else, I suppose you could do it with somebody else, but it doesn't require anyone else. And again, there are zero low and even negative cost ways to approach that. If you'd like to know how long the positive effects of epinephrine last toward improving focus and concentration, well, if we look to that study from DeGroot et al, the acute stress improves cognitive performance study, they measured concentration before and 30 minutes after the stress was induced and there does appear to be a quite long lasting,

01:00:39 Layer Focusing Tools & Design Your Own Protocols

really up to an hour or more effect of increasing epinephrine. So how might you apply these sorts of protocols early in the day or later in the day? Well, one suggestion or one potential protocol would be if you're going to sit down and do some work, if you're already feeling alert and focused, no need to reach to this tool, but if you're feeling like your focus and alertness isn't quite where you'd like it to be, you could take a three minute very cold shower or submerge yourself in cold water for three minutes, you might have a cup of coffee as well and then sit down and do that work, maybe even throw in the 40 HZ binaural beats. All of that would be layering in the different systems, the different neurochemicals, such as acetylcholine, epinephrine and dopamine,

01:01:19 Tool: Short Meditation & Improved Ability to Refocus

that are going to lend themselves to a really terrific 90 minute or less work about. Now I'd

like to discuss some of the purely behavioral tools that quality peer reviewed science say can improve focus and concentration significantly. At the beginning of today's episode, I talked about the study from Dr. Wendy Suzuki's lab where they explored a 13 minute meditation done every day for a period of eight weeks. That meditation led to significant improvements in focus and concentration ability, as well as other aspects of cognitive performance. It also improved mood and reduced stress. So you might be wondering what exactly is this meditation? The meditation is very simple and it's one that anyone can perform. What you would want to do is set a timer for about 13 minutes, I don't think it has to be exactly 13 minutes, but since that's what they included in the study, you would set a timer for 13 minutes. You would sit or lie down, close your eyes, and you would simply focus on your breathing. Most people are going to benefit from only doing that breathing through their nose, but if you have some sort of obstruction or inability to breathe just through your nose, you could probably also do it by breathing through your nose and mouth or just your mouth. But ideally you would do just nasal breathing for a period of 13 minutes, concentrating on that breathing, and concentrating, meaning bringing your awareness, your so-called interoceptive awareness if you wanted to get really technical about it, your interoceptive awareness to a point just about an inch inside of your forehead. Now, of course, that might sound kind of gory to some of you, you've never actually been inside your forehead, but just about an inch behind your forehead is where you would want to place your concentration while also concentrating on your breathing. Now here's the thing about meditation that all studies of meditation show, which is that unless you are a very experienced meditator, your concentration, your focus will drift away from your breathing and away from that location about an inch inside your head, inside your brain, about just behind your forehead. That will happen maybe every 10 seconds, every 20 seconds, maybe even every five seconds, but an important part of such a meditation practice to improve concentration and focus is that you are continually refocusing back to that specific location and refocusing back on your breath. This is something that again, is not often discussed. People think that if you do a meditation and you're supposed to concentrate on your breath, that if your mind drifts that somehow you failed in that meditation, but actually that's not the case. A huge component of improving your ability to focus and concentrate by way of neuroplasticity, rewiring of the circuits for focus and concentration, is the repeated return to a state of focus from a state of non-focus or diminished focus. So think about it like trying to drive down the freeway and staying between the lane lines, excuse me. And every once in a

while, because there's a bit of drift on the vehicle, maybe the wheels aren't aligned correctly or there's something else wrong with the chassis or the steering device, it starts to drift right a little bit, then you hit the rumble strip to go rrrr, and then you pull back to the center. That's really what a focused meditation practice is about as opposed to expecting yourself to stay between the mental lane lines, so to speak. So if you're somebody who's going to do a practice of the sort that I described, 13 minute meditation practice every day, you'd want to sit or lie down, close your eyes, start to concentrate on your breath, focus your attention on a location about an inch behind your forehead, and then fully expect that at some point, you'll be thinking about something else, and that's a cue to focus back to that location just about an inch behind your forehead and back to your breath. By doing that repeatedly over and over, what you're really training up is the network within your brain that indeed includes that prefrontal cortex that you're focusing on as well as some other structures, the inferior temporal cortex, indeed the hippocampus, a structure associated with memory, and other components of the neural circuit that are involved in directing our mental focus and concentration. Again, I can't emphasize the importance of this practice being one of focusing and refocusing. In fact, I would prefer to call such a practice, a refocus focused meditation, or a constantly refocusing, or maybe you all can come up with a better name for it, I'm certainly not that good at naming things, but this sort of meditation practice has been shown in the study by the Suzuki lab and other studies to really improve people's ability to focus and remain focused, so much so that in the beautiful book, "Altered States," they describe a number of different meditation practices, some a little bit longer than the one that I described, one that's 17 minutes, another one that's 30 minutes, some people will meditate as long as 60 minutes a day, although that's quite a long time, in my opinion. The point here isn't how long you focus or somehow trying to achieve total focus for the entire 13 minute or 17 minute or 60 minute about of meditation. While that would be wonderful and I think many people aspire to do that, that's a lot of hard mental work. I think for most people out there, including myself, a relatively short meditation practice of about 13 minutes in which you fully expect your focus and concentration to drift, but that you are continually refocusing is going to be the most effective, yes, indeed, the most effective at teaching yourself to focus and stay concentrated. In fact, I invite you to interpret every time that you focus off that location about one inch behind your forehead, as an opportunity to refocus and think about the refocusing as the trigger for teaching your neural circuits how to focus for extended periods of time. And as a bonus to that sort of meditation

practice, the study from Wendy Suzuki's lab also showed that people experience improvements in sleep and improvements in memory, so not just improvements in mood and reduction in stress and improvements in focus and concentration, but all these other positive benefits from just doing that 13 minute a day meditation practice. It's one that I've started to adopt and have felt tremendous benefit from and that I encourage many of you to try as well. The one cautionary note is the one that I mentioned at the beginning of the episode, which is because the refocus as I'll call it, meditation, does involve a significant amount of effort and engagement of these prefrontal cortical circuits, it is disruptive to sleep if performed too closely to sleep. So if you are going to do that practice,

01:07:40 Tool: Yoga Nidra, Non-Sleep Deep Rest (NSDR) & Defocus Periods

I recommend that you not do it within the four hours prior to your bedtime. Earlier I mentioned that I would talk about ways to improve focus if you are sleep deprived. This is something that I'm all too familiar with. I put a lot of effort into optimizing my sleep, that's something that with each passing year, I put more and more effort into, again, because sleep is so vital for mental health, physical health and performance of all kinds, but certainly in my role as a student, in my role as a professor and in my role in life, I've had numerous times in which I simply did not get enough sleep or my sleep was terrible for whatever reason, and yet I still had work demands and social demands, et cetera. One practice that is very effective at allowing you to focus better than you would otherwise under conditions of sleep deprivation is so called non-sleep deep rest or NSDR. This is also referred to sometimes as yoga nidra. Yoga nidra actually means yoga sleep. Yoga nidra is a practice of lying down for about 10 to 30 sometimes even as long as 60 minutes, you listen to a script, it's an audio script, that takes you through a progressive deep relaxation, it involves a body scan, some long exhale breathing. It is very restorative in the sense that one tends to emerge from yoga nidra or NSDR feeling greatly refreshed compared to how you felt prior to it. There is also terrific neuroimaging data from laboratories in Denmark showing that there's a restoration of dopamine levels in the so-called basal ganglia after NSDR AKA yoga nidra. Whether or not you call it yoga nidra or NSDR, which is what I refer to it as, non-sleep deep rest, you can find these scripts at zero cost in multiple places. You can find there are certain apps that are NSDR or yoga nidra apps. There is a NSDR protocol that was put out there by Madefor

which is on YouTube that you can access for free. There is a NSDR or I should say a number of NSDR protocols through the Virtusan app. There are, again, number of different places that one can access NSDR protocols. I do NSDR for 10 to 30 minutes per day every single day, not just on days where I'm sleep deprived. If I happen to be sleep deprived, I would extend that NSDR to 30 or 60 minutes. And when you do that NSDR will depend on when you have time for that NSDR. When I haven't slept well, what I'll try and do is find a quiet place where I can do NSDR for 30 or ideally 60 minutes. Sometimes I will fall back asleep during that NSDR, that's fine if you do that, but most people will stay awake during the NSDR, and then I'll emerge from that and go about my day. If in the afternoon, I'm very fatigued because of lack of sleep, I might do another NSDR of 10 to 30 or 60 minutes, and then another work about. Again, NSDR is something I do every day. I talked a lot about this in the episodes related to sleep, because it can help you get better at falling and staying asleep at night in addition to feeling restorative in that immediate timeframe of the day in which you do NSDR, so it's immensely beneficial at various times and for various purposes. But here within the context of trying to concentrate and focus when you're sleep deprived, NSDR, AKA yoga nidra is an immensely beneficial practice. There's growing amounts of quality science pointing to the neurochemical replenishing effects, as I mentioned before, dopamine, but also the potential for NSDR to replace sleep that you've lost. I would never want anyone to try and use NSDR as a total replacement for sleep, but under conditions in which you cannot control your sleep, NSDR is going to be the best way that I am aware of to restore your ability to focus and concentrate for whatever purpose. And if you emerge from your NSDR and then drink some caffeine, you'll notice an even greater capacity for focus and concentration for all the reasons directly related to caffeine. So again, NSDR is a general tool for enhancing your ability to sleep and it's a tool that you can use in order to compensate for, at least to some degree, compensate for lost sleep when you need to focus and concentrate. One thing that really contrasts NSDR and yoga nidra with the sort of focused meditation that I talked about a few minutes ago, the 13 minute meditation, is that during the 13 minute meditation, you're actively trying to refocus and focus, whereas during NSDR and yoga nidra, you're actually trying to defocus. So you can think of the 13 minute meditation for refocusing and focusing as directly tapping into and mediating improvements in the circuitry for focus and concentration whereas you can think of NSDR and yoga nidra

01:12:13 Tool: Hypnosis & Focus/Deep Relaxation States

as modulating your brain and body state to allow you to focus and concentrate better. Now another tool that you can use to directly tap in to the circuits for focus and concentration and to greatly accelerate neuroplasticity, the improvements, or I should say the changes in those circuits that will allow you to focus and concentrate better is hypnosis. A lot of people hear hypnosis and they think stage hypnosis, you know, people squawking like chickens and doing things against their will, but actually hypnosis is a atypical but highly accessible brain state that's been studied with a lot of rigor at Stanford University School of Medicine by my colleague, Dr. David Spiegel, he's been a guest on this podcast previously. Hypnosis is a unique brain state because it's one in which you are deeply focused and yet deeply relaxed. So to just sort of set up the array of practices here so you can think about them logically, the focus refocus meditation is based on and focused on focus, no pun intended. NSDR and yoga nidra are aimed at deep relaxation. Hypnosis is this atypical, very powerful brain state in which you combine high levels of focus and deep relaxation. Now it's a little bit of a tough one to just take oneself into, but fortunately, there's a tool based on a lot of quality peer-reviewed research from the Spiegel lab and other labs and that is the Reveri app, r-e-v-e-r-i. The Reveri app is available for no cost, at least for a period of time and then I think they place certain elements of it behind a pay wall, but you can try at zero cost, it's available for Apple, soon I think also to be available for Android, and they have specific hypnosis protocols that you listen to, and these are very brief protocols, follow the instructions, you're listening to a particular audio script of David Spiegel himself, and some progressive breathing and actually some eye movements that are directly linked to the neural circuits that allow for these highly focused, deeply relaxed states. And there are components within the Reveri app specifically geared towards improving focus and concentration. So again, there's meditation for focus, there's deliberate decompression, NSDR, yoga nidra, which take you into deep relaxation, and then hypnosis is this very special, very directed state of highly focused and highly relaxed, or I should say deeply relaxed, that allow access to the neural circuits for focus and concentration and allow you to tune those up and to improve those very significantly in a very brief amount of time. And again, some of those hypnosis scripts are as short as eight minutes, some are as long as 13 minutes. So what we're really talking about here are zero cost tools that directly tap into the neural circuits, the components within your brain, that allow for deep relaxation, allow for deep

focus, and improve your ability to focus and concentrate over time simply by repeating these. How often do you need to repeat the Reveri hypnosis for focus and concentration before you see benefits? Well, that will vary from person to person. I tend to use it once every third or fourth day and have experienced tremendous benefits from it. I don't think I'm unique in that sense, they have a lot of data to support this Reveri app and the protocols within it. How long do you have to do NSDR before you experience those benefits? There, I would say the first time and every time, because it's so deeply relaxing that you emerge from it feeling quite restored relative to how you went into it. And as I mentioned earlier in the study on meditation, it took about eight weeks to see the effects that they observed in that study, but they didn't observe shorter time points. So I highly encourage people to explore meditation geared towards focus and refocus, also NSDR, nonsleep deep rest, AKA yoga nidra, and the Reveri app, Specifically the hypnosis within the Reveri app, that's geared towards improving focus and concentration. All of these have terrific science to support them, this is not woo science or hacks or just something that people came up with. This is all grounded in work from some of the best universities in the world, from excellent groups who've looked at underlying neural mechanisms and measured things with a lot of rigor, et cetera, et cetera.

01:16:07 Optimal Time of Day to Use Specific Tools

These tools are available to you, I highly recommend that you use them. And if you're interested in the optimal time of day to do these, we already mentioned that the focus refocus meditation shouldn't be done too close to sleep, the Reveri hypnosis app can be done at any time really, in fact, there's a component of falling back of sleep in there, in other words, a hypnosis specifically geared toward helping people teach themselves to fall back asleep when they wake up in the middle of the night. NSDR, I always say, can be done first thing in the morning, in the afternoon or any time of day, and in fact, I'll sometimes do that in the middle of the night if I happen to wake up and need to get back to sleep. So really these tools can be applied most any time of day, except for that one caveat

01:16:46 Tool: Overt Visual Focus & Deliberate Gaze

about the focus refocus meditation not being done too close to sleep. Now there's

another set of behavioral tools that can really help enhance one's ability to focus and those are visual based tools. In fact, the tools I'm about to describe are actually being employed in a number of schools in China and elsewhere in order to teach children to focus better and for longer periods of time. The key principle here is that much of our cognitive focus, our ability to think about something in a very specific way and stay focused on it, to read or to follow a line of conversation or math or music, et cetera, is going to be directed by our visual system. Our visual system has two forms of attention and focus. One is overt focus, which is very straightforward. If I'm looking at the tip of my pen, for those of who are listening right now, I'm looking at the tip of my pen, that's overt focus, I'm focusing on it with my eyes, and of course, the rest of my brain then will follow and start to analyze the details of what I'm seeing and the contours of the pen, et cetera. It seems sort of obvious when you first hear it, but our cognitive focus tends to follow our overt visual focus. That's also why they put blinders on horses. That's also why sometimes wearing a hoodie or a hat or limiting your visual field in some way can help you enhance your cognitive focus, it can help limit distraction. You're just not seeing as much. It's also why when we ingest caffeine or any kind of stimulant or we are stressed and our pupils dilate and our vision becomes more tunnel-like, less panoramic, but more tunnel-like, you know they say a soda straw view of the world or you're looking through a tunnel, your focus, your visual focus is actually driving your cognitive focus. Your cognitive focus is narrower than it would be if you were seeing the whole scene that you're in. So when you hear this, it sounds obvious, but for many people, including many scientists, it's just not obvious that this would be the case. However, that is the case, your visual focus drives your cognitive focus. So what is a practice that has been studied in various laboratories and that's being employed in various schools? Is to have children or adults visually focus on one location for a given period of time. How long? Anywhere from 30 seconds to three minutes, and believe it or not, three minutes is a long time to maintain visual focus at one location. If you were to try that right now, you'd probably find it to be a bit of a strain, but if you want to try it, you can. Keep in mind, you yes, are allowed to blink, but also keep in mind that meditation refocusing practice that we talked about earlier, that the refocusing is the key component of teaching yourself or your brain, you are your brain, your brain is you, but to teach yourself how to focus better. So if you're going to incorporate this practice, what you would want to do is pick a location, it could be on a wall, it could be on your computer in front of you, although I would encourage it to not be the contents of your computer screen, you might just want to

blank your screen, you might want to put a piece of paper with a crosshatch there, any sort of visual target, or you can imagine a visual target and then focus your visual attention on that target and try to breathe normally, try and stay relaxed, and certainly allow yourself to blink so that your eyes don't try out. This is not a test of how long you can go without blinking. By focusing on that particular location and by forcing yourself to refocus on that location anytime your gaze, your vision drifts from that location, you are encouraging the circuits for focus to get better at focusing for longer and longer and at refocusing when your focus drifts off of that location. This is incorporating neural circuits, including the prefrontal cortex, things like the frontal eye fields. For those of you curious about the underlying biology, this practice is recruiting certain elements of your so-called prefrontal cortex, also the frontal eye fields, which are locations not far from the prefrontal cortex, that are involved in deliberately directing your gaze to particular locations in space, not outer space, although you could do this by focusing on stars I suppose, but in visual space. Now I mentioned before

01:20:42 Covert Visual Focus; Deliberate Gaze Warm-Up & Focused Work

that this is overt visual focus and attention, you are overtly looking at that location, but one also very powerful practice for improving focus and concentration is to use covert focus. Covert focus is where my gaze, my eyes are focused on one location, such as my pen, but my focus is actually directed elsewhere in the room or location that I'm in. My mind and to some extent my peripheral vision is focused in this case on the door just to my left in the room that I'm in. That takes a little bit more effort. This is something that all old world primates, of which we are old world primates, are able to do. And it probably evolved as part of the mechanism by which animals could evaluate their scene, evaluate predators, evaluate other primates while not necessarily staring at them directly so they can obtain information, we can obtain information without having to direct our gaze specifically to one location. Maybe we can obtain information from multiple locations, indeed, we can. Without getting too far down the rabbit hole of how vision and cognition relate, because we've done episodes on that previously, and simply focusing on the tools that can be incorporated to improve focus and concentration, here's what I recommend. Set yourself a low bar at first and set a timer and try to focus on one location for 30 seconds and that's it for that day. The next day, you might add five seconds, and then the next day, five seconds after that. If you miss a day, no big deal,

simply do the practice for the same amount of time that you did the last time that you did the practice, and then gradually try and increase the amount of time that you can focus on one visual location overtly by looking directly at that location. If you like, and if you feel you have the ability, you can try and do this through covert attention and focus by looking straight forward for instance, and attending to something in the corner of the room and trying to do that for 30 seconds, you'll find that that's quite a bit harder, and then extending that by five seconds every time you do the practice. This is something that I don't think you necessarily have to build up to being able to do for a full hour in order to extract the benefits. In fact, the best way to think about this practice is as a means to get into a focused state. If you remember back about an hour or so ago, I was talking about how focused states are not a drop all the way in and then exit type phenomenon. We don't just drop into a focused state the same way we don't drop into the peak performance of a workout, we warm up. So what I recommend is having a 30 second to three minute period at the beginning of a about to focus where you're going to do work or physical work and anchoring your vision to one location somewhere in the room or if you want to do it covertly, you can do that, setting a timer and trying to do that for anywhere from 30 seconds to three minutes. What you're doing when you exercise that practice is you are ramping up neural activity within the neural circuits that create focus and concentration. Then, I would stop looking at that location or that covert location and then I would move to the work that you're trying to do, either mental work or physical work. And if about halfway through your 90 minute about or at some point in your 90 minute about of work or exercise, you feel that your concentration is drifting rather than look at your phone and scroll through the thousands of contexts that exists within social media or your phone, try just picking a location again on the wall, focusing back on that location, using that as a ramp up to then direct your focus back towards, if your weight training, sets and reps that you might be performing, if you're running, you might do this, or cycling you might do this by focusing on a particular location and really homing in on that location physically. And this is a practice that a lot of athletes use in fact, and if you're say doing musical practice or math, well then, you'd want to focus on something other than the task that you're trying to perform. But again, using visual focus as a way to ramp up and increase your overall ability to focus and concentrate,

01:24:43 Tool: Omega-3 Essential Fatty Acids

and then applying that to whatever it is that you're trying to learn or perform. Next, I'd like to talk about compounds that can improve concentration and focus, and these are most often consumed as supplements, although some of them, I should mention, can also be derived from food. Again, I just want to remind you that there are things, in this case compounds, that can modulate a biological mechanism, that is can modulate focus and concentration, and there are compounds that can mediate, can directly contribute to concentration and focus. One of the key compounds that supports concentration and focus because it generally supports mood, concentration and focus and brain function in general are the omega-3 essential fatty acids. I've talked about the omega-3 essential fatty acids in a variety of contexts, in particular depression, but also ADHD, there are interesting data on that, and it's really clear that getting somewhere between one and three grams of EPA, that is one to three grams of EPA essential fatty acid per day can improve outcomes, that is can improve mood and can improve cognitive function. And while there's some debate about whether or not it can improve cardiac function, it's very clear, at least to me, that ingesting one to three grams of EPA essential fatty acid per day is beneficial. But again, in the context of focus and concentration, it's in modulating the neural circuits and brain function that are going to support focus and concentration. It's not as if taking one to three grams of EPA essential fatty acid per day is going to tap directly into only the circuits for focus and concentration. That said, and as discussed on the episode of the Huberman Lab Podcast with Dr. Rhonda Patrick, and on the episode on ADHD that I did, and on the episode on depression that I did, I make it a point to ingest one to three grams of EPAs per day. You can get those EPAs from other sources besides supplements, of course, but supplements are going to be the easiest way to do that. You could do that through liquid form, fish oil, cod liver oil, some people who are vegan opt for other sources of EPAs, you can find those out there certainly. Some people even use prescription EPAs to get the dosage really high. Dr. Rhonda Patrick talked about this in the episode with me, that's actually something that she does. I don't take the prescription form, I get them through pill form through our supplement affiliate, which is Momentous, but there are a number of different quality sources of EPAs out there. And some of those quality sources also include things like fatty fish, algae, and things of that sort. So I'll leave it to you as to whether or not you supplement with omega-3 fatty acids in order to get that one to three grams per day or whether or not you do it through food, but I would encourage you to try and reach that threshold

01:27:28 Tool: Creatine Monohydrate

because there are a number of known positive effects for mood and brain function generally. The other thing that can positively modulate brain function and that actually works as a fuel for neurons to function and can improve cognitive performance, and particularly within the brain circuits, such as the prefrontal cortex, that are involved in concentration and focus is creatine. I know many people are familiar with creatine monohydrate for its effects on muscle growth and strength and performance, but it's quite clear that the bulk of scientific studies have examined the role of creatine in the clinical context and as its role in improving cognitive performance. So my read of the literature has led to a practice in which I ingest five grams per day of creatine monohydrate, the sort of standard form that's available in, this is generally available as a powder, that's certainly how I take it. I'll take the creatine powder, I'll mix it with water or with my Athletic Greens or some sort of electrolyte drink, whatever liquid happens to be convenient to ingest that in, the time of day doesn't really seem to be important. Some people are strong believers in consuming creatine post-workout. While that might be beneficial, I simply take it in the morning or post-workout, it sort of depends on when I remember to take it, but that five grams of creatine per day, in my case, really isn't geared towards muscle growth or strength or performance as much as it's geared toward tapping into the creatine phosphate system within the brain and specifically the benefits of creatine for prefrontal cortical networks, again, modulating, not directly mediating, but modulating and generally supporting the brain networks that are going to allow me to generate focus and concentration. So much like sleep, much like omega-3 fatty acids, creatine monohydrate five grams a day

01:29:10 Tool: Alpha-GPC & Acetylcholine, Increased Risk of Stroke? & Garlic

seems to generally support brain function, which will generally support concentration and focus. Now in terms of compounds that more specifically mediate concentration and focus, we have to go back to that arrow metaphor model that we talked about at the beginning of the episode, that included epinephrine, adrenaline, acetylcholine, which acts as this attentional spotlight, in fact, acetylcholine and elevated levels of acetylcholine have been shown over and over again through beautiful work from Mike Merzenich's lab at UCSF and the Kilgard Lab down in Houston, and a number of other

labs, including Norm Weinberger's lab at UC Irvine, again and again, to improve or even directly gate neuroplasticity by increasing focus directly. That's a lot of word soup, but basically what happens is if acetylcholine transmission is increased even transiently within the brain, there's a greater opportunity for neuroplasticity to take place. And the reason there's a greater opportunity for neuroplasticity, AKA learning to take place, is by way of the increased focus that spiking acetylcholine can provide. As I mentioned earlier, there are a number of different foods which contain choline, you can look those up online, choline acting as an amino acid precursor to acetylcholine, but of course, there are compounds, there are supplements that can further and more acutely increase acetylcholine, and indeed, I use these myself. The most effective one I've found is Alpha-GPC. Alpha-GPC consumed at dosages of 300 milligrams to 600 milligrams prior to a work about or prior to a workout greatly increase one's ability to focus and concentrate, at least that's been my experience, and there are some good data in humans. So how would I use Alpha-GPC? I would use Alpha-GPC by taking it about 10 to 20 minutes prior to any time I want to focus or concentrate very deeply. I've taken as much as 600 milligrams at one time, although I find that 300 milligrams is enough for me, and I tend to be quite sensitive to supplements and caffeine in general, so I'll sometimes take it alongside yerba mate or with yerba mate or with coffee prior to a workout or prior to a about of work in which I'm focusing on mental work. So it could be reading, writing, could be math, could be data analysis, could be anything where I need a lot of focus and concentration. Now a number of people have contacted me about a recent study suggesting that Alpha-GPC when taken chronically over many years could increase one's vulnerability to stroke. I've looked at those data and my read of the data is that they're not very conclusive, although anytime you see something like that, a study that's pointing to the fact that a given compound might increase the propensity for stroke, you obviously want to be concerned. So we have to ask ourselves how, by what mechanism that is, could Alpha-GPC be increasing the susceptibility to stroke? And it seems to be related to increases in TMAO, which is a marker related to the cardiovascular system. And one known way to offset increases in TMAO that are associated either with Alpha-GPC or increases due to other things, so ingestion of particular food compounds actually can increase TMAO, is to offset that by taking 600 milligrams of garlic. Now I've been taking Alpha-GPC pretty consistently for a number of years. I do not take it every day. I would say I take it about four days per week, again, prior to workouts or bouts of cognitive work. I have not seen my TMAO spike and I've evaluated that by way of blood

tests, but nonetheless, I take 600 milligrams of garlic in capsule form anytime I eat anyway and I do that for general cardiovascular function and there's some interesting data on immune system function, et cetera for garlic. So I've been consuming 600 milligram capsules of garlic for some period of time. Some days, I'll ingest just one 600 milligram capsule, other times, I'll take two, but based on this recent study and the concerns about TMAO, I make it a point to always ingest a 600 milligram capsule of garlic anytime I take Alpha-GPC, which again for me is about four days per week. So in our model of attention and focus, you can now clearly see why taking Alpha-GPC, which increases acetylcholine transmission would be beneficial for concentration and focus and why taking it with a double espresso or why taking it with yerba mate would further increase concentration and focus because as I mentioned earlier, caffeine is going to increase epinephrine. It's also going to increase the density of dopamine receptors and the Alpha-GPC is going to increase acetylcholine, this spotlighting for cognition, this ability to really amplify the activity of specific neural networks, which is largely what's happening

01:33:52 Tool: L-Tyrosine Supplements & Food

when you're trying to focus and pay attention to something specifically. So if one wants to increase the amount of dopamine transmission in the brain and body for sake of increasing concentration and focus, one of the most efficient ways to do that is by ingestion of the amino acid L-tyrosine. Again, L-tyrosine can be derived from food sources, I invite you to look up those various food sources on the web, simply go to a web browser and put in foods that contain a lot of L-tyrosine and you'll get a rich array of choices to select from. But in my case, I use L-tyrosine in capsule form. I will take 500 milligrams of L-tyrosine, 300 milligrams of Alpha-GPC and a cup of coffee. I'm careful to do this early in the day, certainly not after two or 3:00 PM because I don't want to diminish my ability to fall and stay asleep that night. I'll do this early in the day before a workout or before a about of concentrated mental work. Again, I tend to do this about four days per week,

01:34:47 Combining & Choosing Focus Tools, Variability

so certainly not every time I sit down to do work. And I should also mention that I still

tend to do the behavioral tools. I'll tend to use five minutes of binaural beats or binaural beats throughout the work session, sometimes do a ice bath or a cold shower before. I don't want to give the impression that I combine every tool that I've talked about today for a given workout. I mean, that would be pretty wild to take a cold shower, pop an L-tyrosine, take an Alpha-GPC, drink two espresso, listen to binaural beats. That to me seems like a very inefficient way to go about life. In fact, I make it a point to try and use tools to increase my ability to concentrate and focus, but not to combine more than two or three of them at any one time. And when I say two or three, what I mean is I will use supplements like Alpha-GPC, L-Tyrosine and caffeine together before certain work bouts, I might use the visual practice of focusing on a given location for a minute before I begin that work about, I might combine those. Then another time I might take a cold shower prior to doing some work. Other days, I confess, I've slept very well or my enthusiasm about what I'm about to work on is such that I don't require any of these tools. Again, there's no requirement, there's no pressure to use any of these tools, behavioral, supplement based or otherwise. It's simply a matter of using the tools that are going to allow you to achieve the states you want to achieve and to improve your ability to go into those states without any help at all. And this is what I find particularly attractive about supplements. It's not so much that they put you into the ideal state for that work and then you accomplish that work and then you always rely on those supplements. I prefer to look at supplements of the sort that I just described as a route into a deeper trench of focus and concentration that I use as a tool to teach myself to focus and concentrate more deeply, such that I don't need those tools every single time I try and focus and concentrate. I think this is an important point because I think that many people think of supplements

01:36:50 ADHD Prescriptions, Training Neural Circuits, Maintenance & Reduced Dosage

as a crutch or a way of simply getting into a state for which no other tool will suffice or replace. But in that context, I want to remind you of the larger context of pharmacology, which is the vast landscape of prescription pharmacology for ADHD, for attention deficit hyperactivity disorder. Now I covered that landscape in intense detail on the episode on ADHD and focus. And just to summarize, there is of course, Adderall, Ritalin, Vyvanse, Modafinil, Armodafinil, a number of different compounds, all of which generally increase

dopamine transmission in the brain, so increasing dopamine, and all of which generally increase epinephrine, adrenaline transmission in the brain and body. And many of those compounds have been of tremendous benefit to children and even some adults who suffer from ADHD. So properly prescribed at the appropriate dosage, those compounds can really help people with clinically diagnosed ADHD. The way they help those people is a bit surprising, however. You might think, well they turn on the brain chemicals that allow those people to concentrate and focus. That's true, but they also have the benefit of teaching those brain circuits how to engage. And that's one of the reasons why somewhat paradoxically giving a stimulant like Ritalin or Adderall to a kid that legitimately needs it, obviously, you don't want to do this without the oversight and careful evaluation of a psychiatrist, but giving that to a kid who has severe ADHD, you would think would make them more rambunctious, less able to focus and more distractible overall. After all, Ritalin, Modafinil, Armodafinil, all these things are stimulants. So you take a kid who has attention deficit hyperactivity disorder and give them these drugs that increase transmission of dopamine and epinephrine and you think, wow, it's going to make them even more distractible and hyperactive and indeed, it has the opposite effect. It doesn't necessarily make them feel calm, but it makes them feel that they can focus, they really can anchor their attention. And the idea is that it's teaching those neural circuits or those neural circuits rather are teaching themselves to engage and to focus and concentrate. And the ideal situation is one in which the total dosage of those compounds, those drugs, can be reduced over time as those circuits learn to come online through purely behavioral tools. Now oftentimes, there's a maintenance of those drugs over long periods of time, although there is a common practice nowadays of trying to diminish the dosage overall.

01:39:19 Tool: Optimal Order Approaching Focus Tools, Prescriptions & Dependency

That's in the context of ADHD and prescription medication and I acknowledge that a lot, indeed 80% or more of college students say the statistics are using prescription drugs when they are not in fact prescribed those prescription drugs. So basically what I'm saying is there are a lot of people using drugs designed for ADHD and narcolepsy because those drugs will effectively increase focus and concentration, but I strongly discourage the use of powerful prescription drugs that have not been prescribed to you. First of all, it's illegal. Second of all, it's quite dangerous to hit the accelerator of those

neural circuits with such vigor because it can increase dependency and they can have a number of other side effects outside the context of clinically diagnosed and prescribed ADHD medication. But in the context of supplementation, the increase in dopamine, acetylcholine and epinephrine that one can achieve from say 500 milligrams of L-tyrosine, 300 milligrams of Alpha-GPC and a cup of coffee is going to be substantially less than one would see for prescription drugs. So you're getting a modest effect that can similarly teach those brain circuits for focus and concentration how to engage better. But as a general backdrop to all of this, I always say and I'll say it again and again probably until the day I die, which hopefully is a long time from now, but regardless, it'll be the same message, I always believe that behavioral tools should come first, behavioral tools should come first. Then focus on nutrition. In fact, I would say behavioral and nutrition tools, and of course, get excellent sleep. Then focus on supplementation and then, and only if those are failing to bring your brain and body to the state you need to be in to perform well in school and work and life, et cetera do I recommend that people lean on prescription drugs. Now there's a caveat to that, which is in under conditions like severe eating disorders, obsessive compulsive disorder, bipolar disorder, depression where people are truly at risk of suicide or severe mental health effects or behavioral health effects and they're really at, their lives are at risk and their overall mood and wellbeing is at risk, it's often the case that people cannot access the brain states required to shift themselves purely with behavioral tools, nutrition, et cetera. So again, for the typical person who's not suffering from one of the psychiatric disorders that I mentioned before or other psychiatric disorders, schizophrenia, et cetera, I strongly encourage you to look to behavioral tools first, nutrition, then supplementation, then and only if there's a remaining need, to prescription drugs. This contrasts very much with the typical scenario I hear about these days where college students or other people will say, oh yeah, I hear that there's this drug, Ritalin or Vyvanse that can immediately put me into a state of heightened focus and concentration. Now listen, if you have ADHD, by all means, talk to a physician, talk to a great psychiatrist and figure out whether or not that's right for you. But if you don't, again, behavioral tools, nutrition, supplementation, and in particular, those behavioral tools are going to be the ones that are going to allow you to teach your neural circuits how to focus and concentrate better, and I cannot overstate the importance of that, that the behavioral tools, and to some extent the supplementation combined with behavioral tools really allow you to train up your neural circuits so that you can focus and concentrate

01:42:56 Tool: Phenylethylamine & Dopamine

to the depth and the degree and the duration that's going to best serve your mental and physical goals. Now there's one other compound that I've used from time to time and that I continue to use in order to increase focus and concentration and I will use this in combination with the other supplements I talked about before and that's phenylethylamine. Phenylethylamine is in the dopamine synthesis pathway, so it increases dopamine transmission and tends to function a little bit differently than L-tyrosine. So every once in a while, I'll swap out L-tyrosine and put in 500 milligrams of phenylethylamine or sometimes, if I really want to push a little bit harder on the dopamine system, and I'm going to be doing a long about of intense work, I will take the 300 milligrams of Alpha-GPC, the 500 milligrams of L-tyrosine, I'll generally take that with some caffeine, and I should mention, I don't go past about 100 or 200 milligrams of caffeine 'cause I don't really like feeling too jittery, that's not really my goal, it's the goal to be alert, but not so alert that I really can't focus on anything, I'm not interested in having an anxiety attack after all, but I'll sometimes either swap in or I will add that 500 milligrams of phenylethylamine. Phenylethylamine is in the PEA pathway. I've talked about this in a previous podcast on dopamine motivation and drive, and it's a very short-lived compound. So what I'll tend to do is take it once at the beginning of the workout and sometimes in the middle of the workout, I'll take another 500 milligram capsule. But what I just described with combining all of those compounds, Alpha-GPC, L-tyrosine, phenylethylamine and caffeine, that's a fairly rare occurrence that I'll combine all four and really only under conditions in which I have to do an intensely challenging amount of mental or physical work. I would say the frequency at which I combine all four of those things is probably about once every two weeks, and typically more like once a month, again being careful to do that in the early part of the day,

01:44:50 Tool: Other Supplements to Enhance Dopamine, Epinephrine & Acetylcholine

certainly before the noon hour, so that I am in no way going to disrupt my sleep. I realize that many of you are probably wondering about or hoping that I'll discuss things like lions mane or the racetams or some of the other compounds that are known to powerfully modulate the dopamine, epinephrine and acetylcholine systems. To be quite direct,

there are far too many of these compounds to review in a single episode, and they all generally tap into the same set of processes. Again, epinephrine, that shaft of the arrowhead that we're thinking of as focus, acetylcholine, which is the arrowhead itself, and then dopamine, which is the sort of propeller behind the arrow that allows it to continually drive forward through a about of mental or physical work. There is a wonderful site. I've mentioned it several times before on this podcast. That is [examine.com](https://www.examine.com). That wonderful site that is [examine.com](https://www.examine.com) has recently been updated, they've changed their format. It was terrific before, it provided links to relevant studies, it talked about specific compounds, it talked about the magnitude of effect, it talked about the human effect matrix, it really focused on human studies with links to those studies and on and on. The new revamped version of [examine.com](https://www.examine.com) is even better, it's really next, next level. I really applaud them for doing such a terrific job in organizing the information. There are a lot of interesting pages that you can read there about different compounds. So you can put in any compound, ginko biloba, phosphatidylserine, Alpha-GPC, and you're going to get a rich array of information about those compounds. And if you were to put in a specific goal state, that is focus or concentration or sleep or hormones, like testosterone, et cetera, you're going to get a rich array of compounds and supplements as well as links to the studies on those compounds and some details about those particular studies. It's an absolutely phenomenal site. It's one that I rely on and that I know thousands, if not millions of other people rely on

01:46:46 Behavioral, Nutrition & Supplement Tools for Focus

and I encourage you to check it out. Again, the URL is [examine.com](https://www.examine.com). So today we've talked about a number of different tools and to some extent, some mechanisms involved in concentration and focus, and really the goal has been to provide you an understanding of the neurochemical systems and a little bit about the neurocircuits that can allow you to achieve states of attention and focus. In contrast to previous episodes of the Huberman Lab Podcast, where I've covered these topics in tremendous depth as it relates to mechanism and also focused on tools, today, I largely focused on tools. So we talked about behavioral tools, like a meditation that's 13 minutes long done daily specifically to improve your ability to focus, and in fact, there are data to support that it will. We talked about hypnosis, we talked about visual focus, overt and covert, we talked about various supplements, such as Alpha-GPC, phenylethylamine, L-tyrosine,

supplements that I use to directly modulate the neural circuits for concentration and focus. We also talked about creatine and the omega-3s. We talked about the importance of sleep, which modulates our ability to function mentally and physically overall, so optimize that sleep. And we talked about a number of other protocols that you can incorporate. My hope in giving you all this information in one single location is that you'll be able to pick and choose which of these protocols you would like to incorporate into your attempts to improve your focus and concentration. Again, I don't recommend doing all of these protocols all at once. What I recommend is picking a handful of them, maybe one or two, maybe three or four, and trying them in different combinations at different times of day and for different purposes, for mental work, for physical work, et cetera, and find what is best for you. Once again, the goal is to teach your brain, that is to increase neuroplasticity in the neural circuits that allow you not just to focus, but to refocus your attention. And I'd be remiss if I didn't mention that it's also critical to be able to defocus. I highly encourage people to take a period of time each day to daydream, to walk down the hall without looking at your phone, to not have to incorporate more sensory information, to not place increasing demands on yourself to focus, and see and realize how having a period of deliberate decompression and defocusing can allow your brain to focus so much better when you do decide to return to a about of focus, concentrated work or physical work.

01:49:12 Zero-Cost Support, YouTube Feedback, Spotify & Apple Reviews, Momentous Supplements, AG1 (Athletic Greens), Instagram, Twitter, Neural Network Newsletter

So I want to thank you for joining me for this discussion about tools for focus and concentration. If you're learning from and/or enjoying this podcast, please subscribe to our YouTube channel. That's a terrific zero cost way to support us. In addition, please subscribe to the podcast on Spotify and Apple. That's also a zero cost way to support us. And on both Spotify and Apple, you can leave us up to a five star review. If you have questions for us or comments or suggestions or guests that you'd like us to consider bringing on the Huberman Lab Podcast, please put all that in the comment section on YouTube, we do read all those comments. Please also check out the sponsors mentioned at the beginning of today's episode, that's the best way to support this podcast. During today's episode and on many previous episodes of the Huberman Lab Podcast, we discuss supplements. while supplements aren't necessary for everybody,

many people derive tremendous benefit from them for things like sleep and enhancing focus and hormone augmentation and so forth. As mentioned at the beginning of today's episode, the Huberman Lab Podcast is now partnered with Momentous supplements because they are of the very highest quality, they ship internationally, and they have single ingredient formulations in dosages that will allow you to construct the best, most biologically and cost effective supplementation protocol for your needs. If you're interested in the supplements covered on the Huberman Lab Podcast, you can go to livemomentous, spelled o-u-s, so livemomentous.com/huberman. If you're not already following us on social media, we are [hubermanlab](#) on Twitter, and we are also [hubermanlab](#) on Instagram. Both places, I talk about science and science related tools, some of which overlap with the contents and topics of the Huberman Lab Podcast, much of which is unique from the contents and it's certainly the format covered on the Huberman Lab Podcast. Again, that's [hubermanlab](#) on Instagram and [hubermanlab](#) on Twitter. The Huberman Lab Podcast has a newsletter in which we provide summaries and essential protocols from the Huberman Lab Podcast episodes. You can access it totally free of charge by going to hubermanlab.com, go to the menu and click on newsletter, provide your email. We do not share your email with anybody and you'll receive our monthly newsletter. There are also examples of previous newsletters there that you can download as PDFs right away without even having to sign up. So thank you once again for joining me for today's discussion all about the mechanisms and especially the tools for enhancing concentration and focus, and last but certainly not least, thank you for your interest in science.