

## How Meditation Works & Science-Based Effective Meditations | Huberman Lab Podcast #96

In this episode, I discuss the biological mechanisms of the state changes that occur during different types of meditation and describe how to develop the meditation practice optimal for you. I explain key meditation principles, such as using specific breathwork patterns and adjusting your perception to specific locations along the continuum between interoception, exteroception and dissociation. I discuss how meditation practices lead to long-term trait changes and neuroplasticity, including changing your default mood, reducing baseline anxiety/depression, increasing your ability to focus, enhancing relaxation, improving sleep, and increasing your overall happiness level. I also explain the concept behind the “third-eye center,” what mindfulness is from a biological standpoint, the power of ultra-brief meditations and how to select the best meditation and time and duration to meditate to meet your need. I also explain a novel open-eyed perception-based meditation that may enhance focus, relaxation and task-switching ability. Whether you are a novice or an experienced meditator or simply interested in how our brain controls different aspects of conscious awareness and self-regulation, this episode should interest you.

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- Welcome to the Huberman Lab podcast where we discuss science and science-based tools for everyday life. [MUSIC PLAYING] I'm Andrew Huberman, and I'm a professor of neurobiology and ophthalmology at Stanford School of Medicine. Today, we are discussing meditation. We are going to discuss the science of meditation, that is, what happens in the brain and body while we are meditating, and we will talk about the science of meditation as it relates to how the brain and body change as a consequence of meditation, that is, what you export or take from a meditation practice that can impact everything from your sleep to your mood. For instance, meditation has been shown to

alleviate symptoms of depression. And we will also talk about how meditation can be used to enhance focus and other states of mind that are useful for work and other aspects of life. Now, of course, most of you have probably heard of meditation, and when we think of meditation, most often, we think of somebody either sitting or lying down. If they're sitting, we might imagine them in the so-called lotus position, you know, sitting with legs crossed, very upright, with hands on the knees or, you know, crossed in our lap or something of that sort. Typically, we think of somebody who is in a very calm state, eyes closed, focused on their so-called third eye center. The third eye center is the area just behind one's forehead. There's no third eye there, at least there shouldn't be, but I'll tell you why it's called the third eye center and what the origins of that are and why it's relevant, actually, for a meditative practice. With all that said, it turns out that meditation encompasses a huge variety of different practices. Some of those practices indeed are done sitting or lying down with one's eyes closed, focusing on the third eye center. Other of those practices are focused on a body scan, you know, really focusing on one area of the body and its contact with whatever surface you happen to be sitting or lying on or can be done walking. In fact, there are walking meditations done with eyes open. So there are many different forms of meditation, but today, we are going to focus mainly on how specific types of meditation and specific areas of the brain that are activated during those meditations change our way of being in fundamental ways, not just during the meditation practice, but afterwards as well. So if you're somebody who's interested in changing your default state of mood or of thinking or enhancing your ability to focus or improving your sleep or improving performance in some cognitive or physical endeavor, meditation is powerful, but you want to make sure that you pick the right meditation practice. So we will talk about picking a meditation practice that isn't just feasible because you'll do it but is actually directed at the goals specific to you and what you need most. So to give you some sense of the contour of today's episode, first, I'm going to talk about some of the underlying biology, the mechanisms and the brain areas and also the areas of the body that are activated during certain forms of meditation, and, equally important, which areas of the brain and body are shut down or reduced in their activity during specific types of meditation. Then I'll transition into how to best do a meditation practice, how to get the most out of that meditation practice, and then I will talk about how to change or alter your meditation practices according to your specific goals and as you get better at meditation. And this can get a little bit counterintuitive, but in a positive way. What I mean by that is, for instance, a lot of people think that as you

meditate and get better at meditating, you need to meditate more and more and more, sort of like if you get better at running endurance races that you need to keep running longer and longer, you know, first a 5K, then a 10K, then a marathon, then ultras. With meditation, it's actually quite the opposite. The better that you get at dropping into a particular brain state and the more your so-called traits of brain state shift, not just states as they're sometimes referred to, but traits, this is a theme that I've picked up from a terrific book that I'll refer to later, but the more that you can get into specific neural circuits quickly, actually, the less you need to meditate in order to derive the benefits of meditation. So that's a wonderful aspect of meditative practices that's unlike a lot of other forms of mental exercise and cognitive enhancing exercises. So we'll talk about all of that today, and I promise that by the end of today's episode, you will have a rich array of meditative practices to select from, you'll know why each of them work

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and why they can be directed toward particular goals and how to do that, and you'll also know how to modify those meditation practices under conditions where you might get busier or where you're suffering from lack of sleep, and I think a lot of people will be excited to know that today we're going to discuss a specific form of meditation that can indeed reduce your need for sleep and still allow you to enhance your cognitive and physical abilities. Before we begin, I'd like to emphasize that this podcast is separate from my teaching and research roles at Stanford. It is, however, part of my desire and effort to bring zero-cost-to-consumer information about science and science-related tools to the general public. In keeping with that theme, I'd like to thank the sponsors of today's podcast. Our first sponsor is InsideTracker. InsideTracker is a personalized nutrition platform that analyzes data from your blood and DNA to help you better understand your body and help you meet your health goals. Now, I've long been a believer in getting regular blood work done for the simple reason that many of the factors that impact your immediate and long-term health can only be analyzed from a quality blood test. One issue with a lot of blood tests and DNA tests out there, however, is that you get information back about hormones, blood lipids, et cetera, but you don't know what to do with that information. InsideTracker makes understanding all of that very easy and, even better, points to specific directives, that is, things you can do in terms of your lifestyle, your nutrition, supplementation, et cetera, in order to bring those numbers related to

metabolic factors, lipids, hormones, et cetera, into the ranges that are optimal for you, your immediate and long-term health. If you'd like to try InsideTracker, you can go to [insidetracker.com/huberman](https://insidetracker.com/huberman) to get 20% off any of InsideTracker's plans. That's [insidetracker.com/huberman](https://insidetracker.com/huberman) to get 20% off. Today's episode is also brought to us by Thesis. Thesis makes custom nootropics, and to be honest, I am not a fan of the word nootropics. I've said this many times before on this podcast and other podcasts, and the reason I don't like the word nootropics is that it means smart drugs. And as a neuroscientist, I'm aware that there are neural circuits, that is, connections in the brain and body that underlie things like focus or our ability to switch tasks or creativity, et cetera. There is no neural circuit for being smart. And so Thesis understands this, and as a consequence, they've developed custom nootropics that are designed to bring your brain and body into specific states to become, for instance, more focused or to engage in creative work or to have more energy for workouts and things of that sort. At Thesis, you can go there, you take a brief quiz, and they will design a kit of four different custom nootropics that you can try and then modify along with their help so that you can develop a kit of custom nootropics that are perfect for your needs. Perhaps one for creativity, another one for motivation, another one for focus, and another one for energy. They'll build those for you. To get your own personalized nootropics starter kit, you can go online to [takethesis.com/huberman](https://takethesis.com/huberman). Again, that's [takethesis.com/huberman](https://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 ROKA. ROKA makes eyeglasses and sunglasses that are of the absolute highest quality. The company was founded by two all-American swimmers from Stanford, and everything about ROKA eyeglasses and sunglasses were designed with performance in mind. Now, I spent a lifetime working on the visual system, and I can tell you that your visual system has to contend with an enormous number of challenges in order for you to be able to see clearly. ROKA understands this and has designed their sunglasses and eyeglasses to be worn in any number of different conditions and for you to still be able to see with crystal clarity. They were designed for things like cycling and running so they won't slip off your face if they get sweaty, they're extremely lightweight. In fact, most of the time, I can't even remember that they're on my face, they're so lightweight. However, they also can be worn anywhere, to work, to dinner, et cetera. They have a terrific aesthetic, unlike a lot of other performance eyeglasses out there that you can only find in designs that really make people look like a cyborg. ROKA makes the cyborg versions, some people like those, but they also make versions of their

eyeglasses and sunglasses with frames that you can wear out to dinner, to work, et cetera. If you'd like to try ROKA eyeglasses and sunglasses, go to [roka.com](https://roka.com), that's [roka.com](https://roka.com), and enter the code Huberman to save 20% off your first order. Again, that's ROKA, [roka.com](https://roka.com) and enter the code Huberman at checkout. The Huberman Lab podcast is now partnered with Momentous supplements. To find the supplements we discuss on the Huberman Lab podcast, you can go to [livemomentous.com/huberman](https://livemomentous.com/huberman). And I should just mention that the library

00:08:25 Brief History of Meditation: Consciousness, Psychedelics, fMRI

of those supplements is constantly expanding. Again, that's [livemomentous.com/huberman](https://livemomentous.com/huberman). Let's talk about meditation. As I mentioned earlier, we are going to talk about what areas of the brain and body are active during meditation and after meditation and why that can be so beneficial. We will also talk about when and how best to meditate. Now, this is a topic I've long been interested in. I was first given a book on meditation when I was in high school because, to make a long story short, I was a bit of a wild one early in my high school years, and as a consequence of a program that I was in, somebody handed me a book on meditation. That book is still available now. That book is called "Wherever You Go, There you Are" by Jon Kabat-Zinn. He was one of the first, not the only, but one of the first people to really start popularizing meditation and mindfulness practices in the United States. So this was in the late 1980s, and it was really only until recently that there were very few studies of meditation, although those really picked up in the '90s. Now you can find many, many thousands of studies on meditation and their mechanistic basis, so brain imaging studies, changes in hormones in the body. But in the late 1980s and in the early 1990s, because functional imaging of the brain, so-called MRI or fMRI, was really just starting to emerge as a popular tool in laboratories and hospitals, there really wasn't that much mechanistic understanding about how meditation worked, but, of course, there was a deep understanding from cultures outside the United States that meditation was extremely useful. I should just mention, as long as we're talking about the history of meditation, any discussion about meditation is going to be a discussion about states of mind, and any discussion about states of mind invokes the word consciousness, a kind of a dangerous topic to get into in any format because a lot of people talk about consciousness, but people use consciousness, the word, to mean different things. It doesn't have one standard

operational definition as scientists call it. However, discussions about consciousness are often part and parcel with conversations about things like psychedelics and kind of alternative therapies. And so in the 1960s and especially in the 1970s, meditation and psychedelics were actually close cousins in the conversation about consciousness and states of mind. That conversation started to split into two different divisions, and I'll explain why in a moment. It gets to a little bit of interesting academic sociology. But what happened was there were a couple of guys at Harvard, including Timothy Leary and others, who got really interested in psychedelics, in particular LSD, lysergic acid diethylamide. And at that time, that was part of the whole counterculture movement, it was considered very anti-establishment, and they were really encouraging students at Harvard to take LSD. They were also very interested in meditation. But what ended up happening is they essentially got kicked out or fired from Harvard, and there's a book that I'll refer you to in the show note captions if you're interested in learning more about all this. But they got kicked out and fired for their emphasis on psychedelics. Now, nowadays, there's a lot of interest in psychedelics. We've had episodes with Dr. Matthew Johnson from Johns Hopkins University who's running clinical trials on psychedelics like psilocybin and LSD for the treatment of depression and PTSD. We've also had Dr. Nolan Williams on the podcast, my colleague at Stanford who's doing incredible studies on some of those compounds as well. So nowadays, the conversation about psychedelics is coming back, and it's somewhat divorced from the conversation about meditation, but in the 1960s and 1970s, the conversation about psychedelics and meditation was sort of one and the same. That changed in the late 1980s and early 1990s when people like Jon Kabat-Zinn started writing books that were purely about meditation and suggesting that people explore meditative practices for the utility to bring calmness, adjust stress, improve sleep, et cetera, divorced from the conversation about psychedelics. Now, that's not to say that the scientific community immediately embraced the conversation about meditation. In fact, it took quite a long while for schools like Harvard and Stanford and other universities around the world to start embracing and funding studies of meditation, asking what sorts of brain areas are involved, how it changes the body, and, perhaps most importantly, how a meditation practice can shift the brain and body when somebody is finished meditating and is off in their life doing their everyday things. In the late 1980s and especially within the 1990s, the advent of brain imaging technology like magnetic resonance imaging, MRI, or functional magnetic resonance imaging was a way to look at the brain while it was active, not just to get an image of its structure, but also



how it's functioning in the areas that so-called light up. When all of that technology became accessible and popular, well, that allowed a large number of laboratories to start asking how specific patterns of thinking and breathing, maybe people sitting in the lotus position, but more often than that, it would be people inside of an MRI magnet because it is a magnet, they sort of put you into a little tube and push you into the tube, not against your will of course, but put people into the tube, have them meditate, and then look at how the brain changed and to do that over time. When those studies were done, what was discovered was really quite miraculous, really. And now we don't think of it as surprising, but what was discovered was a huge laundry list of brain changes. And then when people were evaluated in their outside life, so when they would fill out reports of their subjective feelings of happiness or they would report their sleep, or even if objective measures were taken like changes in hormones or markers of inflammation, et cetera, a large list of information fell out of that which revealed that indeed there are many, a dozen or more clear benefits of a regular meditation practice, and some of those meditation practices could be quite short. So nowadays, we think of meditation as pretty commonly accepted, and in fact, that has a lot to do with the fact that many of the major tech companies in the Bay Area during the 2000s such as Google and Apple and any number of different social media companies and other companies and business ventures, et cetera, and investment firms all over the world started hiring people to train meditation or had online courses for meditation. So nowadays, we think of meditation as this thing that almost everybody understands can benefit us, but we now sit at an interesting frontier where most people think of meditation as one thing, sort of like the word exercise, which, of course, could mean weight training, it could mean running, it could mean high-intensity interval training, all of which, as you know, will get you different results depending on what you do, how often you do it, and the specifics of what you actually do. So, too, meditation can give you very specific results. It can give you more focus, it can give you better sleep, it can give you a combination of results just like exercise can depending on the exercise. So what we are going to talk about next is the specific changes that happen in the brain with specific aspects of meditation. That is, what happens when you close your eyes, what happens when you focus your attention inward versus focusing your attention outward because, as I mentioned before, there's third eye meditation where you close your eyes and focus on that spot just behind your forehead and you focus on your breathing. There's also meditation practices where you're focusing on what you're eating with a lot of so-called mindfulness, being very

present to whatever's happening, not letting your mind wander or think about yesterday or tomorrow or what's happening next, but really focusing on the present. There are also meditation practices, of course, where you are in a format of interpersonal communication where you're really listening very intensely. That, too, is a form of mindfulness. So we're going to parse each of these things, and we are going to ask what's happening in the brain and body during each of these meditation practices so that you can develop specific meditation practices that you can invoke in your real life on a daily basis or, thankfully, I would say, for some who are pretty busy,

00:16:19 How the Brain Interprets the Body & Surrounding Environment; Mindfulness

that you could even do once a week or even once a month that will still clearly benefit you in specific ways. I'd like to spend the next 10 minutes or so talking about the neuroscience of meditation, and I promise you I'm not going to just list off a bunch of different brain areas that are active during meditation. That wouldn't be useful to you. In fact, I don't believe in throwing out a lot of nomenclature without also giving some mechanistic explanation as to what different brain areas do. And you could say, "Well, what good is it knowing what different brain areas do and their names if I can't actually manipulate those brain areas?" But the good news is you actually can manipulate those brain areas. As I'll tell you today, you can turn up the activity in certain brain areas and turn down the activity in specific brain areas with specific elements of a meditation practice, so that's quite exciting and quite different really from other aspects of neuroscience that we might discuss on this podcast. So there are a few different brain areas whose names I'd like to arm you with. And again, the names themselves aren't essential, but if you can grasp even the top contour of what I'm about to say, you'll be in a much better position to parse and use the information that follows. There's an area of your brain that sits right behind your forehead that's called the prefrontal cortex. Basically, it's the front bumper of your head just behind the bone, okay? That area just behind your forehead that we call the prefrontal cortex actually encompasses a lot of different things. And actually, you have two of them. You have one on the right side of your brain and you have one on the left side of your brain, and they're connected to one another but they actually do different things. The area that I'd like to focus on today for a bit is the so-called left prefrontal cortex, or if we were going to get really specific, we'd say the left dorsolateral prefrontal cortex. Dorsal means up, lateral means to the side, so

if you want to touch the left side of your head and move your hand just toward the midline, toward the sort of top of your head a little bit, so that's dorsal, and then lateral, as long as your hand is still on the side of your head, you're in the left dorsolateral prefrontal cortex, okay? So you've got your hand probably right over your left dorsolateral prefrontal cortex. That area of the brain, we know from lesion studies where it's been damaged in animals or humans and we know from stimulation studies where it's been selectively stimulated in animals, or yes, indeed, also it's been done in humans, has an incredible ability to control your bodily senses and to make sense, that is, to interpret what's going on in terms of your emotions and your bodily sensations. So from now on, unless I say otherwise, if I say prefrontal cortex, I'm specifically referring to the left dorsolateral prefrontal cortex, but I'm going to shorten that up just for sake of simplicity and ease of communication. If I'm going to talk about another area of prefrontal cortex, I'll talk about another area, but if I say prefrontal cortex today, what I mean is left dorsolateral prefrontal cortex. Stimulation of left dorsolateral prefrontal cortex or, I should say more appropriately, when your left dorsolateral prefrontal cortex is active, you are in a great position to interpret what's going on with you emotionally, to interpret your bodily signals of comfort or discomfort, and then to make really good decisions on the basis of that interpretation. And that's because the left dorsolateral prefrontal cortex is in direct communication with and is directly connected to another brain area called the anterior cingulate cortex, or ACC. Now, I'm just going to refer to it as the ACC, okay? The ACC is an area of your brain that is interpreting a lot of different things about bodily signals, for instance, how fast you're breathing, whether or not your heart is beating quickly or slowly, and, more importantly, whether or not your heart is beating quickly or slowly for the circumstance that you are in. So for instance, if you're running up a hill and you're even in great shape and your heart is beating very fast, it's unlikely that you are going to be concerned about your heart beating fast because that is appropriate for the circumstance. However, if you're just walking along and all of a sudden, your heart starts beating very quickly for no apparent reason, well, then you are going to interpret that as either pathologic or uncomfortable, inappropriate for the context that you happen to be in. The left dorsolateral prefrontal cortex is the area of the brain that actually has some control over and especially can interpret what's going on in this ACC region. Now, most of you probably haven't heard of the ACC. Most of you probably have heard of a brain area called the amygdala. It's an almond-shaped structure on the two sides of the brain, people talk about it as the fear center, et cetera. But your ACC, the anterior cingulate

cortex, gets input from areas like the amygdala, your threat detection centers, but it also gets input from an enormous number of other areas of your brain and body, including your heart, your gut, so it gets information about how full, that is, distended, or how empty your gut is. It gets information about how quickly you're breathing from input from your lungs and related structures. It's an absolutely critical station for making sense of what's going on in your body, and it works very closely along with one other structure. And I promise this is going to be the third structure in this triad, and then I'll stop listing off names. So we have dorsolateral prefrontal cortex. Think of that as sort of the interpreter of what's going on inside of you. You have the ACC, or anterior cingulate cortex, which is the area of your brain that's bringing in all this information about what's going on inside your body and even on the surface of your body. You know, if you have any pain or an itch or a mosquito bite on the surface of your body, your ACC would definitely register that. And then there's this other absolutely incredible brain structure which is called the insula, I-N-S-U-L-A, insula, and the insula has a bunch of different parts to it. But the insula is another area that is interpreting signals of what's going on in your brain and body, so the ACC and the insula are working together to try and figure out, you know, what's going on inside me? And in addition to that, the insula is interpreting information about what's going on outside of you. So your insula is saying, for instance, hey, this is a steep hill that I'm running up, and as a consequence, whatever heart rate increase that I'm experiencing or heavy breathing or burning in my lungs, this all makes sense. I don't have to be worried, I don't have to be scared. I might want to slow down, but this makes sense. Whereas, for instance, in the example I previously gave, where if you're sitting in a room and everything is pretty calm, and all of a sudden, you start feeling really uncomfortable, like your stomach doesn't feel right or you start breathing quickly or you start having a so-called anxiety or panic attack, in large part, that's because the shift in your bodily sensations doesn't match or doesn't correspond to something in the outside world. So there's this incredible triad which includes the left dorsolateral prefrontal cortex, the cingulate or anterior cingulate cortex, and the insula, and those three are working together in a kind of conversation, it's a neural conversation, but a conversation nonetheless, trying to figure out, okay, what's going on inside me? How do I feel? What am I thinking about? And this could be thoughts about the past or the future or the present. They are also in a conversation as to whether or not the sensations that you're experiencing, meaning how quick your breathing is or how slow your breathing is, how your heart feels, how your skin feels, any sensations of pain, or

pleasure for that matter, whether or not that makes sense for the situation you're in and trying to determine whether or not you are doing the right things as a consequence of those sensations. Okay, so again, if you can't remember the names of these different neural structures in the brain, don't worry about it. It's really not that critical. What is critical is that you understand that there's a conversation that's constantly occurring as long as you are awake trying to figure out what's going on inside of you and whether or not it makes sense relative to what's going on outside and around you. Now, humans are smart. That is, we are, to some extent, conscious of the fact that we have memories of the past, awareness of the present, and anticipation of the future. So we do realize, for instance, that we can be seated at the dinner table, excuse me, and have a thought about something tomorrow, maybe an exam that's stressing us out or something like that, and that will change our bodily state in a way that is not optimal for what we're doing in the moment but that can still make sense to us because that exam is important, maybe we're feeling some pressure about a hard conversation we have to have, or maybe we are very excited about the next day and we can't eat because we're so excited, and that can make perfect sense to us because we do have access to this knowledge about self that we can think about the past, the present, or the future. So that makes the conversation these three structures are in even more interesting and dynamic because what it means is that we can be doing something, eating, talking, running, any number of different activities, and our bodily state may or may not match what we are doing in a way that's adaptive for that, and yet that can be completely okay or at least understandable for us. Now, a major emphasis of a meditation practice is to make us so-called more mindful. What is mindfulness? Well, again, there isn't one perfect universally accepted operational definition of mindfulness. That's basically nerd speak for saying people can't agree exactly what mindfulness should be, is, and means for everyone. But most people assume, and I think agree, that mindfulness includes something about being present. And when I say present, that doesn't necessarily mean present to one's surroundings because of course a lot of meditation practices that are designed to make us more mindful and present are designed to make us more mindful and present to what's happening internally while ignoring everything that's happening externally, but they are designed to make us more present

to our bodily sensations and, in particular, our breathing and our thoughts in the moment. So let's now explore what a generic meditation practice looks like, and let's evaluate how that tends to change the activity of these neural circuits in the brain and body. And then from there, we can split the conversation into a couple of different bins, that is, meditation practices that are ideal for enhancing focus, meditation practices that are ideal for improving mood, meditation practices that are ideal for improving sleep, and meditation practices that, believe it or not, benefit all of those things in one fell swoop. Okay, so what happens during a meditation practice at the neural level? In order to answer that question, we are going to be scientists. That means you and I are going to be scientists now. We are going to break down a practice into its different component parts and address what we know for sure about the brain activation states that occur with those different component parts. In order to do that, let's use a somewhat generic form of meditation, but it's generic and pretty far-reaching because I would say that for most people, about 75%, let's say, a meditation practice is going to involve stopping, meaning getting out of motion, sitting or lying down, and, in most cases, closing one's eyes, although it is absolutely not required to close one's eyes during meditation. There are many forms of meditation that are done eyes open. But for most people, it's going to involve stopping our movement, that is, not ambulating, not walking or running, so seated or lying down with eyes closed. When we do that, meaning when we sit or lie down and close our eyes, as trivial as that shift might sound to you, it actually is a profound shift in the way that your brain and other neural circuits in your body function for the following reason. When we close our eyes, we shut down a major avenue of what's called exteroception. What do I mean by exteroception? Well, very briefly, we are sensing things on our body and in our body all the time. We are also sensing things from outside of us all the time, so these could be sights or sounds, touch on our body, sensations withinside our body, et cetera. Now, sensation is distinct from what we call perception. Perception is, put simply, the sensations that we happen to be paying attention to. So at any given moment, you are sensing many, many things. There are sound waves hitting your ears, there are pressure receptors on the bottoms of your feet sensing your shoes or your sandals or the floor, et cetera, but you're not perceiving them until you place your attention on them. Now, the way perception works is that you have so-called spotlights of attention. You can't perceive everything all at once, every sound, every sight, every touch. That would be overwhelming. In fact, that would be terrible. Rather you have spotlights of perception that can either be very narrow, so for instance,

you could focus all of your perception right now on your big toe of your right foot and really pour all of your awareness, your attention into what you're perceiving there, what it feels like, if there's tingling or pressure, heat or cold, et cetera, or you can broaden that spotlight to include both feet or all your toes on both feet and then your legs and your whole body or the entire room. Perception is like a spotlight, and I should mention there are very good data that we can split our attention into two but probably not more than two spotlights, and we can make those spotlights of perception either very broad and diffuse or very narrow. You can practice this now if you like. You can pick a spot on the wall away from you anywhere, or if you're driving, you can look at some location, and you can focus intensely on one small location, for instance, a tree in the horizon or a person on the street or any number of different things outside of you, or you can broaden that spotlight to include the entire scene at once. You can also focus a spotlight of perception on your body, say on the left upper portion of your chest. And of course you can focus on the left upper portion of your chest and something outside of you, you can split your attention between those two perceptual spotlights. It's very hard, although not impossible, to have three perceptual spotlights, but most people can split to two points of attention or perception pretty easily. The other thing that most people can do pretty easily is merge those two spotlights or, rather, to have just one spotlight of attention. So you don't always have to have two spotlights of attention on, and here, I'm using the word attention and perception interchangeably. But you could, for instance, have two points of attention, so you're talking to somebody and you're paying attention to whether or not somebody's walking in the door or not, so that's two, or you could be completely focused on the person you're talking to, or you could be completely focused on the stomach ache or the great sensation of hunger that you have in your belly while talking to somebody, in fact, you're not even listening to what they're saying at all. Okay? So you have two spotlights of perception. You can split them or merge them into one. And, this is very important, those spotlights of perception can intensify or dim, and there, I'm using analogy. What I mean by that is your perception of what's happening within those spotlights can be very, very high acuity. That is, you can register very fine changes in detail like tingling on one side of your big toe of your right foot versus the other, or it can be somewhat more diffuse. You're just thinking about your whole toe, which, in that case, seems like a small area, but the point is that you can consciously adjust the acuity, that is, the fineness of your perception. All of this is under your power because of the incredible ability of a brain structure whose name you now understand and know, which

is the left dorsolateral prefrontal cortex, although there are other areas of your brain involved as well. Your ability to direct your attention to specific things in your environment or within your body or to split those points of attention or merge them or dial up the intensity of how closely you're paying attention to every little shift or ripple and change in sensation there or to kind of dissociate, if you will, for lack of a better word, to disengage from that perception, all of that is under control because of your ability

00:32:27 AG1 (Athletic Greens)

to engage this area that we call the prefrontal cortex, and, in particular, the left dorsolateral prefrontal cortex. I'd like to take a quick break and acknowledge one of our sponsors, Athletic Greens. Athletic Greens, now called AG1, is a vitamin mineral probiotic drink that covers all of your foundational nutritional needs. I've been taking Athletic Greens since 2012, so I'm delighted that they're sponsoring the podcast. The reason I started taking Athletic Greens and the reason I still take Athletic Greens once or usually twice a day is that it gets me the probiotics that I need for gut health. Our gut is very important. It's populated by gut microbiota that communicate with the brain, the immune system, and basically all the biological systems of our body to strongly impact our immediate and long-term health, and those probiotics in Athletic Greens are optimal and vital for microbiotic health. In addition, Athletic Greens contains a number of adaptogens, vitamins, and minerals that make sure that all of my foundational nutritional needs are met, and it tastes great. If you'd like to try Athletic Greens, you can go to [athleticgreens.com/huberman](https://athleticgreens.com/huberman) and they'll give you five free travel packs that make it really easy to mix up Athletic Greens while you're on the road, in the car, on the plane, et cetera, and they'll give you a year's supply of vitamin D3+K2. Again, that's [athleticgreens.com/huberman](https://athleticgreens.com/huberman)

00:33:41 Interoception vs. Exteroception

to get the five free travel packs and the year's supply of vitamin D3+K2. Okay, so now if we look at the example of what happens when you sit or lie down and close your eyes and decide to meditate, you should immediately realize that that's a tremendous shift in your perceptual ability, why? Because that spotlight of attention, while it can be oriented toward, for instance, what you hear in the room or maybe the feeling of wind moving



trees in the environment that you happen to be in, when we close our eyes, we shut down one of the major avenues for sensory input, which is vision. And when we do that, there's a tendency for those perceptual spotlights to be focused more so on what happens at the level of the surface of our skin and inside of our bodies. And that informs us about something very important, which is that there are actually two axes or two ends of a continuum of perception. Up until now, I've been talking about perception and intention as kind of the same thing, and indeed they are, at least for sake of this conversation, but within that word perception or within that word attention, there's a continuum, and that continuum has on one end something called interoception. Interoception, spelled with an I, is everything that we sense at the level of our skin and inward, so the sensation inside our stomach, the sensation of our heart beating. Some people can sense their heart beating pretty easily. Other people have more challenge doing that. What we are feeling on the surface of our skin, how hot or cold we feel, that's interoception. In contrast, at the other end of the continuum is so-called exteroception, spelled with an E. Exteroception is perception of everything that's outside or beyond the confines of our skin. So by shutting our eyes, and in particular, in a meditative practice where we direct our attention toward our so-called third eye center, this area right behind our forehead, which, not so incidentally, is the prefrontal cortex, or in some cases where people will focus on their breathing, so the movement of their stomach or the movement of their diaphragm or the lifting of their chest or the extension of their belly while they breathe. By doing that, we are taking what ordinarily is a perceptual state that's split between the outside world, exteroception, and usually also toward our inner state. You know, most people are generally in touch with how they are feeling from the skin inward while they are also paying attention to what's outside of them. You can think about somebody, for instance, at a restaurant or a sandwich shop about to order a sandwich and you're reading the menu, so that's exteroception, right? The menu is outside the confines of your skin. And little ideas or maybe big ideas come to mind about what the roast beef sandwich or the vegetarian sandwich will taste like, what it will do for you, what's in it, what you like, what you don't like, et cetera. That's splitting interoception and exteroception. But when we close our eyes, we stop, we slow down, we focus on our breathing or that third eye center, the majority of our perception then shifts to interoception. And when we shift down to that end of the continuum of interoception, something very important happens. What happens is that those two regions, the ACC, the anterior cingulate cortex, and the insula, really ramp up their levels of neural activity,

and that should make perfect sense to you because those are areas of your brain that are registering and paying attention to the various sensations of how full or empty your stomach feels, whether or not the surface of your skin feels hot or cold, and on and on. So by just sitting down or lying down and closing your eyes, your brain undergoes a massive shift from exteroception to interoception. Now, that's not to say you can't be distracted by external events, and, in fact, many people are, but the early stages of transitioning into a meditative state involve this shift down the continuum, or, I should say, to one end of the continuum because there's no down-up, there's just the continuum, shift along the continuum to heightened levels of interoception. Now, I mentioned this briefly before, but many people are very interoceptively aware just naturally, even if they don't do a meditation practice. Other people are not. And there's a pretty good measure of whether or not you have high levels of interoceptive awareness or capability, and that is your ability to count your heartbeats without placing your fingers anywhere with any pressure to take your pulse. You can do this if you like, you can actually try and estimate your number of heartbeats simply by trying to feel your heart beat. Some people are very good, meaning they're very accurate at doing this, other people are not. It does seem to be an ability that can be trained up quite a bit, and, in fact, meditative practices will improve your interoceptive awareness, but, and this is a very important point, heightened levels of interoceptive awareness, while that might sound attractive, oh, to be really in touch with your body, that is not always beneficial, why? Because many people who, for instance, have excessive levels of anxiety have excessive levels of anxiety because they are very keenly aware of any subtle shift in their heart rate or breathing or change in the sensations within their stomach. Whereas other people who are less aware of their bodily state, that can be beneficial, right? It can be adaptive or not, depending on the circumstances. It's probably not adaptive to be very, very aware of your internal state if, for instance, you're doing public speaking, you don't want to be thinking about what's going on in your stomach or how quickly you're breathing. I'm certainly trying to ignore all those signals, those sensations now. But for somebody who has no awareness of what's going on, very little interoceptive awareness, that can be problematic, too, because these are the very people who can ignore the fact that they're having a heart attack or can ignore the fact that they have high blood pressure and are carrying about life focused on everything external with no awareness of their own body. They're, quote, unquote, out of touch with their body. So we want to be very careful about placing valence, which is a sort of value of good or bad on

interoceptive awareness versus exteroceptive awareness. More importantly, we want to emphasize that when you undergo a meditation practice, if it's of the sort where you stop your movement and close your eyes, you are training for interoceptive awareness. This becomes important later when we get into discussions about meditation for reducing anxiety. Some people may opt, in fact, I would say some people ought to opt for a meditative practice which involves more exteroceptive awareness, actually a meditation like a walking meditation or even a seated meditation where they are bringing their focus to a place outside their body as opposed to inside their body. And in fact, there are examples of people who have meditated quite a lot who develop such a heightened state or awareness of their interoceptive components, that is, just fancy, again, nerd speak for so aware of their breathing and of their heart and of the state of their gut that it actually is intrusive for daily activities. So I will ask you to ask this question of yourself now. Are you somebody who tends to be very in touch with your bodily sensations, so, for instance, from the skin inwards? Or are you somebody who tends to be less in touch with or aware of your interoceptive state? There is no right or wrong answer. You don't get an A or an F or a D or a C depending on your answer. It's just a good question for each and every one of us to answer, and I think most people will answer that it depends. It depends on whether or not you are in a social setting or whether or not you're alone. But we are going to return to that answer so keep it in mind because it will become very beneficial in building an optimal meditation practice for you. But for now, just note, there's this continuum of perception, interoception and exteroception. Closing your eyes increases interoception. Opening your eyes dramatically increases exteroception just automatically, just automatically because so much of your brain, in fact, 40% or more, is dedicated to vision. And this, I should say, for those of you that are low vision or no vision and those of you that are blind or have poor vision, this entire process is translated to the auditory, to the sound domain, so it's true for people that can see and it's true for people that can't see. Of course, people that can't see, closing the eyes doesn't have this huge shift towards interoception, but there have been a few studies, not as many as I would've liked to find, but a few studies of, for instance, people who are blind or have low vision, don't see very well, and when they close their ears and they can't hear the external world or they put headphones on or noise-canceling headphones,

then the world inside of them becomes very prominent relative to the world outside of them for obvious reasons. So I asked you to ask yourself whether or not you are somebody who tends to be more interoceptively aware or not, more exteroceptively aware or not. And some of you might not be able to answer that question, and if you can't, chances are that you are effectively sliding along that continuum depending on the activities that you're doing. So you're probably the kind of person where if somebody comes over to you and starts talking to you, you will engage in that conversation, and you don't feel so inside your body that you're thinking about your heart beating and whether or not you're flushing red, et cetera, you're going to pay attention to what they say. Many people, however, when somebody talks to them, if they have social anxiety or even a slight bit of social anxiety, will be thinking about whether or not their cheeks are flushing or whether or not they look right or sound right or whether or not they have something in their teeth. These are normal responses, but they really speak to this issue of whether or not you tend to shift more towards interoceptive awareness or exteroceptive awareness. And, of course, it's context dependent. It will depend on whether or not you're, you know, out on a date with somebody that, you know, you would loathe to find out later that you had food in your teeth or whether or not you're with somebody you're more familiar with where that would not really matter much or the other person would tell you this kind of thing. What does it mean to be at one location or another location along this continuum of interoception or exteroception? Well, we know what it means neurally, right? We know that if you are more interoceptively aware, your insula and ACC are active, but that's not very useful. That's not helpful as a tool. That's just a fact. Now, there have actually been studies of what a meditation practice can do in terms of moving you along this continuum from where you naturally sit in order to help you function not just during the meditation but at all times. And in order to illustrate this, I want to start with a description of what is now a classic study. It's a very cool study, it has a very cool name. It talks about something very important that will come up again and again in today's conversation, and that's something called the default mode network. The default mode network is a collection of different brain areas that essentially are active when we're not doing much of anything and certainly is active when we are not focused on one particular task or conversation or activity. The default mode network can be thought of more or less as the network that generates mind wandering or our thoughts drifting from the past to the present to the future. Remember, earlier, I talked about how your perceptual spotlight can either be two spotlights or they can merge.

Well, similarly, human beings can think about the past, surely, the present, definitely, and the future. And it turns out we can also split our thoughts just like we can split our perception into two of those three things, so I can think about the past, a past event, and I can think about the present. I can split my thinking and my memory in that way. I can also think about the present and the future. I can also think about the future and the past, although it's very difficult, although not impossible, to split one's thinking and memory into the past, the present, and future simultaneously, not easily done, but pretty easy to split one's attention and thinking into two of those three things, either the past, the present, and the future or any two of those three things, okay? Just like with attentional spotlighting, you can place your mind, your thinking, and your memory, your cognition onto one of those things and be very, very present or the past and the present and so on and so forth. The default mode network, while it involves a lot of different brain areas, can be thought of simply as the network of brain areas that are active when your mind is wandering between these different time domains. And the paper I'd like to share with you, as I mentioned before, is now a classic paper, it has a wonderful title, which is A Wandering Mind is an Unhappy Mind. Now, that sounds almost like a news article or a news article about a scientific paper, but that's actually the title of the scientific paper which was published in the journal, "Science," which is one of the three apex journals. You know, scientific publishing is competitive, but it's especially competitive to get manuscripts accepted into "Science," into "Nature," and into the journal "Cell," so it represents kind of the Super Bowl, NBA Championships, and Stanley Cup, if you will, for you sports aficionados of scientific publishing. This is a paper from Matthew Killingsworth and Dan Gilbert. It was published in 2010, but it's still considered a classic. And this paper, A Wandering Mind is an Unhappy Mind, has a number of very important points. I'm going to paraphrase certain elements of it for you because they say essentially what I would like you to know far better than I could say. So first of all, they started out with a statement, which I confess I disagree with, which is, "Unlike other animals, human beings spend a lot of time thinking about what is not going on around them: contemplating events that happened in the past, might happen in the future, or will never happen at all." I agree with their assertion that human beings do that. That's certainly my experience, although I must say, I don't think there's any evidence whatsoever that other animals don't do it also. So my apologies, Killingsworth and Gilbert, but I'd be happy to go toe-to-toe with you on that. I am not aware of any data that prove one way or the other what other animals are thinking. So let's set aside other

animals, and let's focus on the human animal. Now, their point is still a very good one, which is that humans have this wandering of the mind that they call stimulus-independent thought. That is, there's nothing happening to create these thoughts or anything happening in the immediate environment. These thoughts are just happening on their own internally. That's the default mode network. This study was important. In fact, it was a landmark study because they did it right about the time that smartphones became widely available and in use, so again, 2010. So they basically pinged people, they contacted people on their iPhones many times per day, and they did this for well over 2,200 adults. They had a mix of male and female people in this study. The mean age was 34 years, but there was a range, mean, of course, being average, but there were a range of different ages and so forth. And at any moment, they asked people, "What are you feeling right now?" And they also asked them, "What are you doing right now?" So they were looking for the match or mismatch between what people were doing and what they were feeling. They were essentially trying to probe what people were thinking about, and they also addressed that. And they came up with a kind of a bubble chart, if you will, where the bigger the bubble, the more answers came back about one particular thing, and they assessed whether or not people were happy or not in that moment, or sad or not, whether or not they were focused on what they were doing or not. There are a lot of bubbles in this chart, so I'm not going to read them all. But the important points that came from the data, and, again, this is a very large data set, was that, and here again, I'm paraphrasing, first, people's minds wandered frequently regardless of what they were doing. In nearly half of the samples taken, people were generally thinking about something else, except, it turns out, there's this one little bubble sitting way far out on the horizon here, people claimed, and I'm inclined to believe them, that they tend to be very focused on making love if they were making love in the moment where they were pinged on their iPhone. Now, why their iPhone was there with them at that moment, I don't know. That wasn't included in this description of the study. But all the other activities, grooming and self-care, listening to the news, watching television, relaxing, working, et cetera, et cetera, during all those activities, people claimed that their mind wandered a lot. And then they also assessed, of course, their mood and how those people felt at any given moment depending on what they were doing and how well their mind and their emotions matched what they were doing. And what they say here is second, they revealed that people were less happy when their minds were wandering than when they were not, and this was true during all activities. And then third, what

people were thinking at a given moment was far better a predictor of their happiness than what they were doing. So this is interesting and I think matches a lot of people's experience. In fact, I think as you hear about this study, many of you will probably just say, "Well, duh." I mean, if you're working and you don't like your work and you're thinking about something bad that happened, well, then of course you're not going to be happy. But the key point of this study is that it did not necessarily have to be the case that people were thinking about something unpleasant. In fact, if people were working and they were thinking about something else that was pleasant, that also made them feel unhappy. In other words, the mismatch between being in an activity and having our mind elsewhere led people to report themselves as feeling more unhappy in that moment. And when you total this up, what you find is that people are often not present to what they are doing, and that is a great source of unhappiness, even if their thoughts are those of happy, joyful thoughts. So this is interesting and I think runs counter to what most of us have heard or have been taught, which is, you know, think good thoughts, you know, try and suppress bad thoughts, have a good internal landscape, you know, create a good narrative. That is all true, but equally if not more important is to have the ability to be fully engaged in what you are doing at a given moment. That is the strongest predictor of being happy. And there were several other studies that followed up on this, but their conclusion that they put in the final short paragraph of this paper I think really captures it beautifully. They say, and here, I'm quoting directly, "In conclusion, a human mind is a wandering mind, and a wandering mind is an unhappy mind. The ability to think about what is not happening in a moment," I added the in a moment part, "is a cognitive achievement that comes at an emotional cost." So I know I'm not alone in believing that this paper, *A Wandering Mind is an Unhappy Mind*, and we will provide a link to this paper in the show note captions, is absolutely key in understanding why a meditation practice is so important because a meditation practice is really about adjusting your place along that interoceptive-exteroceptive continuum to what you happen to be experiencing in that moment. And while most people think of a meditative practice as focusing on what's going on internally with your eyes closed, third eye center, focusing on your breathing, et cetera, for any number of minutes or maybe even an hour or longer, there are other forms of meditation in which your exteroception dominates and which you are actively focusing on things outside or beyond the confines of your skin and internal landscape, and that, too, is meditation. And if we are to take the work of Killingsworth and Gilbert, this *A Wandering Mind is an Unhappy Mind*, seriously, and I

know a number of other laboratories have and have supported this research with their findings again and again and again, what this means is that meditating is not necessarily a practice that we do divorced from the rest of life. Meditation and mindfulness in particular, being present to what we are doing in a given moment

00:53:30 Tools: Interoceptive or Exteroceptive Bias, Meditation Challenge

is one of the essential keys to happiness and improved mood even if what we are doing is unpleasant. So that brings us to a tool, and it's a tool that any and all of us can use whether or not you tend to be interoceptively dominant, right, that you tend to pay more attention to your bodily sensations, or exteroceptively dominant. And, again, if you don't know the answer to that question, there's a simple test that you can do. You can just sit down or lie down, close your eyes, and you can ask yourself or assess whether or not your attention tends to fleet to things outside of you, right, cars honking or going by, people in the room, or whether or not you tend to be able to focus on your internal landscape to the exclusion of exteroception and attention to things outside the confines of your skin easily. Now, of course, this will depend on context and situation, even how well rested you are, et cetera, but that's exactly the point. This is the sort of thing you want to do every time you decide to do a meditation practice. In fact, I would suggest that you use this to determine what meditation you do at any given moment. So let's say you are somebody who is a regular meditator or let's say you're somebody who's never meditated and you'd like to develop a meditation practice. I suggest that you do a test of whether or not you are more interoceptively dominant or exteroceptively dominant in that moment. Again, this is not a personality trait. This is a question about where you happen to be in a moment. So let's say you're on a plane or you're in the car. If you're in the car, please don't close your eyes while driving, that's sort of obvious, but do this in a safe way, please. But stop, close your eyes, and assess whether or not you can access and focus your attention primarily on your internal state or whether or not your attention and perception gets pulled to something external, to exteroception. And, again, that will vary depending on circumstance and who you are. Then I suggest opening your eyes and trying to focus your attention to something external to you and seeing or evaluating the extent to which you can divorce your perception from sensations that occur at the level of your skin or internally. Now, I should say that there's no technology, at least not that I'm aware of, absence of fMRI machine, in which case, you are inside an fMRI machine



while you do this. But unless you are in that experiment, and most of us aren't, there's no technology that can tell you, for instance, whether or not you are interoceptively dominant or exteroceptively dominant and whether or not the ratio is, you know, 75 to 25 or what have you at any given moment. You have to assess this subjectively. However, if you sit down, for instance, and you notice that you can equally split your attention between internal sensations and external sensations or whether or not you find yourself pulled into external sensations when you're trying to focus inward or you find yourself pulled inward when you're trying to focus outward, well, that will dictate the sort of meditation that you perhaps ought to perform in that moment. Let me give an example of how you would do this. You would stop in some way, so sit or lie down, close your eyes, and evaluate whether or not you can essentially rule out or eliminate attention to all outside events. Most people won't be able to do that entirely, but try and focus your attention, for instance, on your breathing or the typical third eye center, you know, focusing at a spot right behind your forehead. If you feel you can do that reasonably well to the exclusion of what's happening around you, well, then an important question arises. Should you meditate in a way to enhance that interoceptive awareness? Or rather, should you meditate in a way, for instance, with your eyes open and your attention on a particular portion of the landscape you're in like a tree or maybe even, you know, an object or a plant or something else in your immediate environment to try and cultivate or enhance your exteroceptive awareness? That's up to you, but my bias would be one in which you work against your default state. Again, the default mode network is where you land on this interoceptive-exteroceptive continuum. It's going to lead to more mind wandering, whereas when you encourage or we could even say force yourself a little bit to anchor your attention to either inside your body or outside your body, and you make that decision according to what you are doing less easily, well, then you are actively training up the neural circuits. You are engaging so-called neuroplasticity, the brain's ability to change in response to experience. You are deliberately engaging a shift along that continuum. To make this crystal clear, what I mean is this. Let me give an example. If I were to sit down and I wanted to do some meditation, let's just say three minutes of meditation. There's good evidence that even three minutes of meditation can be beneficial for a variety of things, including enhanced focus and enhanced anxiety management. Let's say I sit down and I notice that I can really focus inward on what's happening at the level of my skin and my internal organs, and I can rule out everything. Maybe that's 'cause the room is quiet or maybe it's just because my brain is in a state

that I'm particularly good at that at that moment or maybe it's just a natural ability. Well then I would opt for a three-minute meditation practice in which I deliberately exterocept, that I build up the circuitry to focus on something external to me because I want, and I think most people would like, to have an adaptive mechanism within them so that they can slide along that continuum and they don't default to whatever happens to be easiest for them in that moment. Now, if I were to sit down and try and focus on what's going on internally and I kept getting distracted by things happening outside of me, opening my eyes or feeling like I need to reach for my phone or paying attention to the sounds in the room, well, then I would actively engage a meditation practice, in this case, a three-minute example but it could be longer, where I'm deliberately trying to focus my perception on events at the level of the confines of my skin and internally. Why do I say this? Well, you know, I love to use the phrase anytime with kids, you know, when they say "This is really hard or something's challenging," or adults will say, "That's really tough." Well, as my graduate advisor used to say, that means you're learning. If something were easy, if you can perform any activity or thought, et cetera, well, then there is absolutely zero reason for your neural circuits to change. It's the friction, it's the feeling that something is hard that turns on the enormous variety of mechanisms at the level of cells, et cetera, that allow you to potentially change your neural circuitry. So challenge and discomfort is the signal to your brain and body that something needs to change, so I'm encouraging you to embark on meditative practices that are not your default, okay? To essentially go against the grain of where your interoceptive bias or your exteroceptive bias happens to be at a given moment. And, again, this will change. For some of you, this will change across the day where early in the day, you are very, very good at doing an interoceptive-biased meditation, and later in the day, you aren't. I actually believe, based on the data that I've covered, and we'll get into a few more papers about this, and my lab is actively working on this as well, that a meditative practice can be made far more effective, that is, it can invoke more neuroplasticity, more shift in brain states and brain circuitry if we do not take the easy path, that is, we go against the grain of what our brain would naturally do in a given moment. So if you're in a crowded airport and you're finding that everything's very distracting, well, then that would be a great time to do some interoceptive focused meditation. Whereas if you are really in your head, you know, you're looping thoughts about the past and present, maybe you're even in obsessive thought, well, that would be a terrific time, an ideal time really, to do a short meditation focused on something external to you. In both cases,

whether or not you're focused on interoceptive bias or exteroceptive bias, you are going against, or I should say you're pushing back against your default mode network. I would argue it's going to be far more effective, that is, you're going to reduce or shift the activity of that default mode network far more and in a far more beneficial way

01:01:48 State & Trait Changes, Interoceptive & Exteroceptive Meditations, Refocusing

if you actively try and suppress your bias toward being more interoceptive or exteroceptive. Now, I think that's immensely beneficial, both for the immediate changes that you experience, what others have called a state change, because that's what it is, and it also can lead to, as we referred to earlier, more neuroplasticity, more changes in the brain circuits that underlie your default mode network and lead to what are called trait changes. And I want to be very clear that I am not the first to make this state versus trait distinction. That's a distinction that was raised in a really wonderful book. In fact, I can't recommend this book highly enough. The book is "Altered Traits: Science Reveals How Meditation Changes Your Mind, Brain, and Body." This is a book by Daniel Goleman and Richard Davidson who've done terrific work and many writings and many TED Talks, et cetera, about meditation. I would say that circa 2016, 2017, this book really captured what I believe to be the most essential elements of the science of meditation and a lot of the history of it as well. Today, we are focusing on much of what's covered in this book but also a lot of things that have happened, excuse me, since 2017. In fact, most of the papers that I'm going to talk about are papers that were published after 2017. But, again, this is a wonderful book where they very clearly distinguish between state changes and trait changes, trait changes being the more long-lasting ones. My read of this book and the literature that follows is, again, that when you sit down to meditate, it is going to be most effective to do that interoceptive, exteroceptive bias assessment. Ask yourself whether or not you are more in your head or outside your head, if you will, and then to do a meditation practice that runs counter to where you happen to be at, that is, that pushes you more externally if you're in your head, and if you're more focused on what's going on around you, that pushes you more internally. Now, I think most people are familiar with how to do an interoceptive-biased meditation. Again, that would be setting a timer. Maybe you don't have even set a timer, you just sit or lie down, close your eyes, focus on that third eye center behind your forehead or focus on your breathing or your bodily sensations. That's typical and often discussed.

Exteroceptive based meditations, you pick a focal point outside or beyond the confines of your skin, so that could be, for instance, a point on the wall if you are indoors, it could be a plant, it could be a point on the horizon far away. What you will find is that your visual system will fatigue a little bit when you concentrate your visual focus at that location. I want to remind you that it is perfectly okay and, in fact, necessary to blink, so you should blink, you can relax your face, you can change your expression. There is no rule that says that you can't do those things. This is not, you know, just beaming a particular location in space and holding your eyelids open. I've been accused many times of not blinking very often. That's for other reasons. It's part of the way I access memory about what I want to say. I don't use a prompter here, so I'm accessing from a sort of internal image in my head. That's how my memory works. But in any case, if you're going to do an exteroceptive-biased meditation, there is absolutely no reason why you wouldn't look away from that location every once in a while in the same way that if you were focused on internal thoughts with your eyes closed and focused on your breathing, every once in a while, your thoughts will skip away from that breathing or from your third eye center. In fact, and this is discussed in the book "Altered Traits" but by many other people as well, one of the key elements of any meditative practice, whether or not it's interoceptively focused or exteroceptively focused, is that it's really a refocusing practice. The more number of times that you have to yank yourself back into attending or perceiving one specific thing. In other words, the more times your mind wanders and you bring it back, actually the more effective that practice is. Again, if you can just focus on one location with laser precision and your mind never darts away from that and you don't have to bring it back, well, then there's no neuroplasticity, nothing needs to change because your nervous system will effectively know it's performing perfectly. So if you're somebody who tries to do meditation and you find that your mind just wanders, just remember every time you scruff yourself and pull yourself back to focusing on some location externally or focus back on your breath or your third eye center, each one of those aren't just opportunities to do better, they are essential to the improvement process. Think about them as ascending a staircase of refocusing. Every time you refocus, you're going up one more level, another stair, another stair, another stair, and I think that will move you away from the kind of judgmental process of thinking, "Ugh, like, I can't focus on anything." Pretty soon, what you'll notice is that the refocusing process will happen so quickly that you don't even perceive it. And, again, this is something that's borne out in the neuroimaging data. A lot of people think that they can

focus with laser precision, but actually, what they are better at doing is refocusing more quickly and consistently over time. There's a classic study about this in very experienced meditators that was done in Japan where they had people with varying levels of meditation ability, so some who had never meditated, others who were really expert meditators with many hundreds if not thousands of hours of meditation under their belt, and they had those people listen to 20 tones repeated over and over, the same tone, and they found that the expert meditators could really focus, and they did this by brain imaging, they could really focus on all 20 tones, whereas most people kind of attenuate or what's called habituate to the tone so that by the 10th or 11th tone, their mind is really going to something else. Now, that's wonderful, but that really just tells us the expert meditators have better focus. But it turns out that the more modern neuroimaging studies have shown that they don't have better focus such that they're staying in a very narrow trench of focus. What they're doing is they're exiting focus and going back in more quickly, more quickly, more quickly over and over again. So rather than think about your ability to focus, think about your ability to refocus,

01:07:35 Tool: Brief Meditations, Waking Up App

and the more number of times you have to refocus, the better training you're getting. So earlier, I mentioned doing this interoceptive-biased or exteroceptive-biased meditation for three minutes. Why did I say three minutes? Well, three minutes seems like a reasonable number for most people to do consistently, you know, once a day. And in fact, there are some studies of one-minute meditations and three-minute meditations and 10 and 60. My laboratory has been studying a 5-minute-a-day meditation, and that clearly has benefits, but I think it's also clear that by three minutes, many of the benefits are starting to arrive. And so while I'm not pointing at any one particular data point here, it's very clear that forcing oneself to direct one's perception, that is, your attention, to your internal state or to something external to you is immensely beneficial if you do it consistently and is, again, especially beneficial if you're focusing your attention on the portion of your experience, either internal or external to you, that is not the one that you would default to in that moment. And some people have taken this to the extreme to say that, you know, you can even just move about your day, and then every once in a while, just do a one breath meditation. To be honest, when I look at the whole of the data, it seems as if it doesn't really matter in order to derive most of the benefits of a meditation

practice. Now, I'm a big fan of some of the newer meditation apps that are out there. One in particular that I've been using and that actually I started using because my dad is a big fan of it and he does now fairly long meditations. He's doing about 10 or 20 minutes at least every other day and often every day, and he convinced me to check out the Waking Up app that Sam Harris has put out. I looked at it, I think some of it sits behind a paywall, but you can access much of it or at least do a trial and try it out without having to get behind that paywall. They're not a sponsor of this podcast, I should mention, but I decided to use the Waking Up app. I think it's terrific, and I think one of the reasons it's terrific is that Sam includes short descriptions of what meditation is doing and what a specific meditation can do for you just prior to doing that meditation. So those meditations can be quite brief. Some of them are a minute long, two minutes long, some are longer or even quite a bit longer. That app, I think, includes a variety of meditations that really encompasses the huge range of possibilities that are possible with meditation, and that, at least by my experience of the Waking Up app, has led to my most consistent meditation practice. And, of course, I would love to get Sam on the podcast as a guest so we could talk about the sort of underpinnings of the Waking Up app and his views on everything from meditation to, I know he's big in the discussion about free will and consciousness, some of the very deep and somewhat abstract discussions. I really hope to get Sam on the podcast at a time not too far from now. Meanwhile, we've never met in person, but I absolutely love the Waking Up app, Sam, and I know my father does as well, and I know many of you already use it.

#### 01:10:30 "Third Eye Center" & Wandering Thoughts

If you haven't tried it already, I really do encourage you to check it out. I want to talk just briefly about this third eye center business because it turns out to be pretty interesting. The third eye is actually a name that's been given to another neural structure, or I should say structure because it's not strictly neural, and that's the pineal gland, and this has an interesting history. I promise I'm not taking off on a tangent here that isn't relevant to meditation. So you have a brain of course, and on both sides of your brain, you tend to have mirror symmetric representations of the same things. What do I mean by that? Well, you have a prefrontal cortex on the right, you have a prefrontal cortex on the left, and they actually do slightly different things. Language is sometimes lateralized to one side, but in general, for every structure that you have on one side of the brain, you have

the same structure on the opposite side of the brain. There's one clear exception to that, and that's the pineal gland. The pineal gland is the gland that makes melatonin, which, at night when it gets dark, secretes melatonin, and that melatonin makes you sleepy, it helps you fall asleep but not stay asleep. Descartes, right, the philosopher Descartes asserted that the pineal was the seat of the soul because it was the one structure in the brain that he saw was not on both sides of the brain, it was only one of them and in the middle. Now, I don't know if it's the seat of the soul or not, I'm not in a position to make assessments like that. But what do we know about the pineal? The pineal, as I mentioned, is involved in releasing melatonin, it does a few other things as well, but it is also considered the third eye for a couple of reasons. One is that it responds to light, although, in humans, not directly. So in birds and lizards and snakes, they actually either have a thin skull, or, believe it or not, two holes in the top of their skull that allow light to go directly in. If you look at the head of a snake, light can go directly into their brain through these holes and activate the pineal to suppress melatonin and control their wakefulness, sleep rhythms. In birds, they don't have holes in their skull, but they have very thin skulls. And, believe it or not, light can penetrate the thinness of the skull in many birds and communicates information about time of day and even time of year, and that's translating to hormonal signals such as melatonin release from the pineal. And so the pineal has been called the third eye because it's a light-sensitive organ inside the brain. In humans, the pineal sits deep, deep, deep to the surface, and light cannot get in there. In fact, if light can get into your brain, unless you are part of a specific experiment where that's the intention or you're having neurosurgery or something of that sort, then you've got serious issues happening. That pineal sits deep, deep, deep near what's called the fourth ventricle, and it absolutely should not see light directly. So the idea that the pineal is the third eye in humans is not true. It just isn't true. So anytime someone says, "Oh, the pineal is your third eye." That's not the third eye center that people are referring to when they talk about meditation. Now, you'll see a number of different forms of art where it will be a picture of a face and the eyes will be closed or sometimes open, and there'll be literally a third eye, like a cyclops eye in the middle of the forehead. That has been proposed for many thousands of years to be, quote, unquote, the seat of our consciousness. Now, that's interesting because that real estate behind the forehead actually turns out to be the prefrontal cortex, which we know from lesion studies and stimulation studies, if you remove that brain area, people become very reflexive. They are not thinking intentionally, they don't become deliberate. In fact, and this is kind of an

eerie result, but if you inactivate, you turn off the prefrontal cortex and you give somebody the opportunity to play a shooting game, for instance, their accuracy goes through the roof. They become essentially like a machine. They see a stimulus, they shoot at it, they see a stimulus, they shoot at it. Their accuracy is exceptional, but their ability to distinguish between enemy and friend completely disappears. So they become a highly effective motor, or I should say sensory motor machine, but their assessment and their judgment about right or wrong completely disappears. This is also true for people that have prefrontal damage. They often will have inappropriate behavior or a hard time suppressing behaviors, et cetera. So the third eye center as the seat of consciousness and our intention is something that makes sense generally with what we know about the neuroscience and neurology, but there's something more to it that I think is especially important for all of you that goes beyond anything about ancient traditions or pineals or birds or snakes and pits in the top of the head, and here's what it is. The brain itself, meaning the brain tissue, does not have any sensory neurons. What do I mean by that? Well, if I touch the top of my hand, I can feel that. If I want to sense my heartbeat, if I work at it, I can feel that. If I want to sense how I feel internally at the level of my stomach, is it full, is it empty, am I hungry, is it acidic, does it ache or does it feel pleasant, et cetera, I can sense that. And that's because we have sensory neurons on our skin and in our body, et cetera. We also have sensory neurons in our eyes that let us perceive things externally. We have no sensory neurons on our brain. This is one of the reasons why you can remove the skull and do brain surgery on somebody who's wide awake and be poking around in there, and they don't need any anesthetic on the brain itself. They need anesthetic for the incision site, but they don't need anesthetic on the brain because it has no feeling. You have emotions, but there's no feeling. So normally, we are perceiving and paying attention to what we are sensing, either externally, sight and sounds, again, exteroception, or internally, interoception, touch, et cetera. But by focusing our perception and our attention not on our bodily surface like a body scan, but to a point a couple centimeters or inches behind our forehead, we essentially are bringing that attentional, that perceptual spotlight to a location in which there is no sensation. There's nothing to feel there. And when we do that, by closing our eyes and focusing on that, quote, unquote, third eye center, which is the prefrontal cortex, to be quite honest, when we do that, something else happens. And what happens is when we are not thinking about and perceiving our sensations, because there are none there, our thoughts and our emotions and our memories sort of mushroom up. A better way to put



it would be that they geysir up and take on more prominence in our perception. What I mean by this is that normally, you know, I'm not thinking about the contact point between me and this chair, but as I'm speaking, I'm in contact with the chair and those neurons are firing. But if I focus my energy and attention on them, they're going to fire the same but more of my perception goes there. Similarly, I'm thinking things all the time. You are too. And I'm perceiving things all the time, and I'm remembering things all the time, and I'm anticipating things all the time about the future. But by focusing my attention on the one organ for which I have no sensation, that is, my brain, well, then thoughts, feelings, and memories, feelings meaning emotional feelings, start to grow in their prominence in my awareness and in my perception. And so this is why when you sit down to a meditative practice, if it's a meditative practice where you close your eyes or you're focused on that third eye center, where you're focused on your brain as opposed to your bodily surface or something external to you, the thoughts seem to come by in waves, and they can almost be overwhelming. It's very hard to, as it's often described, just sit back and watch your thoughts go by because there are so many of them. Actually, the best way to stop thinking is to really focus on something external or to focus on sensation. That's less thinking than it is perceiving senses, okay? So I don't want this to get too abstract. When people talk about the third eye center, they're not talking about the pineal, they're talking about prefrontal cortex, and when you direct your own attention to the very area of your brain that directs attention, there's nothing to sense there. The only things that will become present to you are feelings, emotions, that is, thoughts and memories, and they will often arrive in what seems to be a very disorganized fashion. And the reason they arrive in somewhat disorganized fashion is because, normally, we just don't perceive things that way. Normally, we are splitting our attention, our perception, that is, to multiple things, our sensation and our thoughts. When we put all of our perception into our thoughts, we see how disorganized, how wandering they are and how, in fact, how random and intrusive those can be. Again, random and intrusive. And much of what we talked about in that paper earlier, the one where they asked people, what are you doing and what are you feeling and how happy or how unhappy you are, what they discovered was that most people are sort of in their head a lot. They're not really present to what they're doing, which leads me to the statement that I believe, at least based on the data, that paper included, that most people have an interoceptive bias. They're focused more on what's going on internally than they are focused on what's happening externally. There are certainly people who for the opposite is true, but I think

that this is an issue because we hear so often about the need to do a meditation practice that allows us to focus inward and that we're getting yanked around by all the stressors of life, et cetera, et cetera. And we are, we're getting yanked around by all the stressors and demands of life. But as we do that, we tend to be very focused on what's happening with us. The data clearly point to the fact that being mindful and being aware can enhance one's level of presence and happiness. But we can go so far as to say that being mindful and aware of what's happening, not just with us but external to us in our immediate environment, that includes what other people are saying and doing, that also can really enhance our sense

#### 01:20:46 Meditation: Practice Types, Focal Points & Consistency

of well-being and happiness. At least that's what the data point to. Let's briefly recap where we've been so far. We've talked a little bit about the brain networks that are activated during meditation, which include prefrontal cortex, ACC, the insula. We also talked about the difference between interoception and exteroception and the importance of assessing where you are along that continuum. And I should mention, of course, that you can be right in the middle of that continuum. You might sit down to do meditation and find that you are smack dab in the middle of being able to attend to things outside of you but also attending to things inside of you. In which case, I suggest doing a meditation that is either exteroceptive-biased or interoceptive-biased. But as I mentioned earlier, if you find that you are more, quote, unquote, in your head or in your body, well, then focus on an exteroceptive-biased meditation to build up that set of circuits. Whereas if you are more exteroceptively focused at any given moment, well, then I encourage you to do an interoceptively focused meditation practice. And as I mentioned earlier, there is this issue of how long to do a practice. There are a lot of different data on these, but some of the practices we've covered on this podcast before when we had guests, for instance, highlighted the 13-minute meditation that Dr. Wendy Suzuki from New York University's laboratory has popularized, and they popularized it because they have a wonderful paper that we will provide a link to which shows that a daily 13-minute meditation, which is of the traditional third eye, interoceptively biased, focus on breathing, and focus on that location directly behind one's forehead or both, that meditation done daily for about eight weeks, maybe shorter, but in that study, eight weeks, greatly improved mood, improved ability to sleep, improved cognitive ability and

focus, memory, a huge number of metrics were looked at very specifically. So that's a terrific one. And you may be asking yourself, do you need to do the full 13 minutes? Could you get away with five minutes or three minutes? Well, my laboratory has shown benefits in stress reduction, improvement in sleep, et cetera, with a five-minute-a-day meditation. However, in trying to establish how long you should meditate, I would ask yourself a couple of questions. First of all, what is a practice that you can do consistently? And by consistently, that doesn't necessarily mean every day. If you answer the question about consistency honestly, and you find that you can only do one meditation session per week, well, then I would encourage you to go a little bit longer, maybe 10 or 15 minutes, maybe even 30 minutes. Again, understanding that you're going to have to refocus repeatedly throughout that meditation regardless of whether or not you're focusing on internal perceptions or external perceptions. If, however, you can set aside 5 or 10 or 15 minutes per day and you can meditate every day, well, then I think you have a bit more flexibility in terms of how long you meditate. Maybe it's three minutes one day, one minute the next day, 10 minutes the next, and so on and so forth. Just like with exercise, the key component is consistency, and this is borne out in all the data that's covered in "Altered Traits." It's also borne out in all the recent studies that have come out since that book was published. Consistency is key, so ask yourself what you can do consistently, and also don't necessarily burden yourself with always having to do the same amount or duration of meditation. So earlier, we decided we were going to parse or fine slice the meditation practice, and indeed we've been doing that. We've talked about interoceptive versus exteroceptive bias,

#### 01:24:10 Breathwork: Cyclic Hyperventilation, Box Breathing & Interoception

and we've been talking about where you place your perception or your focus. Another key component of meditation is the pattern of breathing that you embrace. In fact, the pattern of breathing that you embrace during your meditation practice can itself be its own form of meditation. What do I mean by that? Well, these days, we hear a lot about breathwork. Breathwork has really grown in popularity in the last 5, 10 years, and there are a number of reasons for that. First of all, I think we need to credit Wim Hof, or can we call him, I think appropriately, the Great Wim Hof? You know, certainly there were people before Wim who were doing deliberate breathwork and talking about deliberate breathwork, but it was really about 2015 or so that Wim Hof started to grow in

recognition and popularity for a particular style of breathing, which, in the laboratory, we call cyclic hyperventilation. I know there are other names for it that come from ancient traditions. He named it, or people named it after him, Wim Hof. Wim Hof, for those of you that don't know, is a Dutchman who is known to hold many world records for deliberate cold exposure, including swimming under icebergs, longest period of time buried in ice up to his neck, et cetera, but who's also expert in the use of breathing in particular ways in order to manage and maneuver through those challenges. And he started speaking about different patterns of breathwork, in particular, the use of cyclic hyperventilation, deep, deliberate breathing, so big inhales [inhales], exhales [exhales], big inhales [inhales and exhales] exhales. In the laboratory, again, we call that cyclic hyperventilation. It's very clear from studies both done on Wim specifically but on the general population as well by my lab and other labs that that pattern of cyclic hyperventilation, of deliberately breathing deeply and repetitively, typically in through the nose, out through the mouth, generates a lot of adrenaline or causes adrenaline release from the brain and body. It, quote, unquote, heats up the body. Indeed, it raises body temperature, but the liberation of adrenaline does a number of things to shift the state of the brain and body. That, more or less, is what Wim Hof breathing is, although Wim Hof breathing, or some people will call it tummo breathing or cyclic hyperventilation, is not a pattern of breathing typical of most meditations that have been discussed, at least not in the research literature. Now, that's not to say that cyclic hyperventilation can't be incorporated into a meditation practice, but Wim Hof breathing aka cyclic hyperventilation/tummo is typically considered its own practice, okay? Its own breathwork practice divorced from meditation. It might have a meditative component, but it's not often discussed as meditation or as part of meditation. More typically, a meditation practice involves slowing one's breathing, and this could be in the form of cyclic breathing of inhale, exhale, inhale, exhale, which is cyclic, or, in some cases, doubling up on inhales and then exhaling, so inhale, inhale, exhale, inhale, inhale, exhale, or controlling the duration of inhale, breath hold, exhale, breath hold, repeat, so-called box breathing where the inhale, the hold, the exhale, and the hold are of equivalent durations. Any number of different breathing patterns, slow cyclic breathing, box breathing, a cadence of three to six seconds in, holding for two seconds, and seven seconds out, regardless of what cadence of breathing one uses, there is a tendency during most meditative practices to slow one's breathing and/or control one's breathing in deliberate fashion. This is essential because when we default our breathing, that is,

when we don't pay attention to how long we are inhaling relative to our exhales, when we don't deliberately exhale, that is, normally we just passively exhale but we actively inhale, I repeat that, normally, when we're not thinking about breathing, we deliberately inhale, there's a motor command that's sent to inflate the lungs, and then we passively exhale. But in many breathwork practices or meditation practices, we actually actively exhale as well. Well, when we do that, a number of things happen. First of all, it forces us into interoception. Why? Because the diaphragm, the muscle that helps move the lungs essentially and create a specific cadence of breathing or depth of breathing as one would with box breathing or deliberately slow breathing, well, that muscle resides inside of us, and so when we focus on our breathing, more often than not, we aren't focused on the actual air leaving our nasal passages or mouth, maybe a little bit, but more typically, we are forced to focus or we just default to focusing on the movement of our diaphragm or of our belly or the rising and falling of our chest. All of that is to say that by deliberately focusing on our breathing, we shift to interoception. So breathing and specific patterns of breathing are sort of along for the ride in meditation, but the reverse can also be said, that when we focus on our breathing, we shift to interoception and away from external events. It doesn't mean we can't still pay attention to external events, we can still exterocept, but at least some portion of our perception, of our attention shifts to interoception. So we of course need to breathe to stay alive. We have to breathe at least every so often in order to stay alive, so, of course, breathing is part of any meditative practice, just like it's part of any living activity, even sleep. But if the first component of meditation is to direct our perception in a deliberate way, using that prefrontal cortex, to a specific location, either on the surface of or within our body or external to our body, or both, but typically one or the other, then we can say that the second element of a meditative practice is the pattern of breathing, and we can ask ourselves, can it and should it be deliberate or not? In other words, do we just default to however we happen to be breathing, or should it be deliberate? That is, should we be controlling the depth and the cadence? And I do believe that, based on what we know about the capacity for specific patterns of breathing to shift our brain state, that controlling one's pattern of breathing during meditation can be enormously useful, and that is true regardless of whether or not

01:30:41 Tool: Meditation Breathwork, Cyclic vs. Complex Breathwork

one is focusing on interoceptive perceptions within our body or exteroceptive perceptions. So that raises the question, how should we breathe during meditation? Well, there is, again, no simple one-size-fits-all rule there, but there are some general rules of respiration physiology that can help us access and develop a meditation practice that is going to best serve our goals. And since this is not an episode all about respiration, and we will do one, I simply want to give you the basics of what respiration can do to shift your brain and body state. Before I do that, however, I want to give a very specific instruction, which is when you sit down to meditate, or if you're going to do your meditation walking, that's fine too. I should just say when you are about to begin your meditative practice, you need to ask yourself a question. Do you want to be more relaxed than you are at present, or do you want to be more alert than you are at present when you exit the meditation practice? Do you want to calm down, or do you want to become more alert? Simple question. You can decide from session to session. You could even switch within a session. But just as you need to assess whether or not you are leaning more interoceptively or exteroceptively, you also need to ask yourself, do you need to calm down or want to calm down, or do you want to be more alert at the end of your meditation session? Or maybe you want to go into a state of deep relaxation and then exit with more alertness. The way to do that is very simple using breathwork and specific patterns of breathing. And here is the general rule that is supported by all the respiration physiology that I'm aware of. I'm oversimplifying here, but I'm oversimplifying intentionally so you can simply apply the tool. And then, as I mentioned before, we will do an episode all about respiration physiology in the future. Essentially, if your inhales are longer and/or more vigorous than your exhales, then you will tend to be more alert or you'll shift your brain and body towards a state of more alertness. This is simply based on the way that the neural circuits like the pre-Botzinger nucleus and the parafacial nucleus that govern respiration physiology and alertness, it's simply the way they work. They communicate with brain areas that release noradrenaline and norepinephrine, et cetera. In contrast, if you emphasize longer duration and/or more vigorous exhales relative to your inhales, you will tend to relax more, you will tend to calm your nervous system. Now, you might be saying, "Okay, I understand what it is to make an inhale longer than my exhale, but how do I make it more vigorous?" Well, it simply means drawing more air into your lungs more quickly than you allow yourself to exhale that air. So an example of inhale-biased breathwork would be [inhales and exhales] [inhales and exhales], so there's an active emphasis on the inhale, and it's a little bit longer than the

exhale which is passive. Conversely, if you want to relax, then you want to extend your exhales relative to your inhales, and you can even make them active exhales. So it can be inhale [inhales and exhales], exhale [inhales and exhales]. That's going to shift your nervous system in a direction of more calm. And, of course, if you would like to stay at the level of alertness aka calmness because those are two sides of the same seesaw or the same continuum, if you'd like to be right where you're at at the end of your meditation as where you started, at least in terms of levels of alertness and calmness, well, then you would just keep your inhales and your exhales relatively balanced in terms of duration. Now, the introduction of things like breath holds with box breathing or Wim Hof breathing, typically, it's 25 or 30 deep inhale, exhales, deep inhale, exhales, and then exhale all your air, hold your breath for 15 to 60 seconds, and then repeat and so on, sometimes some inhales and holds. Well, that's a whole business into itself. But for sake of meditation, the key thing to understand is that if you are going to do a complicated breathing practice, it will, by design, by necessity, shift much of your attention to the breathing practice, especially if it's not cyclic, if it's not inhales follow exhales. Cyclic breathing is where inhales always follow exhales, follow inhales, follow exhales. It actually relies on a specific brain center called the pre-Botzinger complex discovered by Jack Feldman at UCLA. He was a guest on this podcast previously. However, if you are doubling up on your inhale, so two inhales [inhaling], and then an exhale [exhales], a pattern of breathing my laboratory has studied extensively, well, then that relies on a different brain center, the parafacial nucleus. The point is that if you are engaging in noncyclic breathing or you are deliberately emphasizing inhales or exhales or the vigor of inhales and exhales, et cetera, well, then some portion of your attention will be devoted to making sure that you follow that breathing practice. We are very good at going into cyclic breathing practices by default, and our attention can drift to other things. Interoceptive or exteroceptive, it doesn't matter, we can just drift into, you know, how our body feels or something we see or hear in the room, et cetera. When we are focused on our breathing and the breathing pattern is noncyclic or complex in some way in that it involves deliberate voluntary commands, again, from those so-called top-down mechanisms of the prefrontal cortex, well, that, by design, requires some portion, often a significant portion of our attention to be devoted to the breathing practice itself. So what does this mean? This means that breathwork itself can be a form of meditation, and meditation can involve breathwork, but one should know that the more deliberate and unnatural that pattern of breathing is, the less you will be able to focus on other things.

Now, this isn't necessarily a bad thing. You can actually leverage this. So for instance, if you are somebody who's very much caught in your own head, right, we talked about this earlier, or you're in a moment where you're really stuck in your head and you want to get out of your head, well, then that meditation practice that you do really should be focused on exteroceptive bias, you should really focus on something external to you, and I would encourage you to use a natural cyclic pattern of breathing where inhales follow exhales follow inhales follow exhales. If, however, you are finding that you're sort of caught in the landscape of things happening around you and you want to ground yourself, as it's sometimes called... That's a loose language, not a scientific language. I know there's this practice of grounding, and that's a whole thing. People are always writing to me, "Is grounding a real thing, walking barefoot on the Earth and magnetic fields, you know, and gravitational fields?" Well, gravity's real, but, you know, grounding, there isn't a lot of science for it, to be frank. It does feel nice to walk on the ground, however. But if you are somebody who's kind of feeling pulled out of yourself a lot or in a moment and you want to bring your awareness into your body and sort of calm down, well, then I would encourage you to, yes, use a deliberate, somewhat unnatural or non-default pattern of breathing, which, by definition, will force you to attend to what's going on interoceptively. Again, I'm not aware of any place that this has been discussed in detail such as this before. If there is a research literature on this, please let me know. My laboratory has been working on this extensively. I'm always looking for new colleagues and collaborators. We, meaning Dr. David Spiegel who's an expert in hypnosis, again, who's been a guest on the Huberman Lab podcast and my colleague at Stanford Psychiatry. In fact, he's our associate chair of psychiatry, world expert in hypnosis, he's been on this podcast before, we have an active research program focused on these issues. We are very much of the belief that a breathwork practice itself can be meditative, a meditation practice can include breathing, but the more that that meditative practice focuses on the breathing itself, the more interoceptive-biased it will be. Now, it's very important to understand that an interoceptive-biased breathwork practice will have a specific effect, which is to make you more interoceptively aware. And if you think back to earlier in the episode, for many people, that will be a wonderful thing and something that they are actively seeking or ought to seek because it can help people gain awareness, for instance, you know, if they're stressed and they're not realizing it till the end of the day, they're just exhausted, more interoceptive awareness throughout the day can be very beneficial.



## 01:39:22 Interoception vs. Dissociation, Trauma

If, however, you are somebody who is overly focused on your bodily sensations, well, then more exteroception awareness is important. And this brings us to a yet larger theme but a theme that I think really emphasizes what particular types of meditative practices are going to be best for certain people, especially people who are using meditation to combat certain challenges, in particular, mood-based challenges or sleep-based challenges or focus-based challenges. I haven't listed off all the positive benefits of meditation yet in this episode, but they are many, many, many. In fact, there are now tens of thousands of scientific studies showing, for instance, there are known benefits of doing meditation for enhancing sleep, there are known benefits of a regular meditation practice for enhancing focus, there are known benefits of a regular meditation practice for reducing inflammatory cytokines, even improving outcomes in cancer, reducing pain, improving mood, reducing the symptoms of ADHD and clinically diagnosed HD and on and on and on. And, again, rather than focus on all those beautiful studies today which all basically point to the fact that some meditation practice done regularly, even if it's very brief, has tremendous, even outsized benefits on our health even relative to some drug treatments, that's been shown. Rather than focus on all that, I've been more focused on what sorts of brain and body changes occur when we do a meditation practice and, perhaps more importantly, what really constitutes a meditation practice. We have this thing about a continuum of perception. We also now are talking about breathing. Well, there's another component that I'd like to raise now, which we could say is the third major component if the first one that I raised was interoceptive versus exteroceptive bias or continuum, the second being breathing, is it going to be default or deliberate breathing? Is it going to be natural cadence or unnatural cadence? Again, no right or wrong, it just depends on what your goal is. There's a third component. This is a component, again, that hasn't really been formalized in the literature but that Dr. Spiegel and I are working hard to formalize through some research and through an upcoming review that we will provide links to once it's out, and that's a separate continuum which is the continuum between interoception and dissociation. So now all of you know what interoception is, but most people probably don't know or don't realize what dissociation is. Often we hear about dissociation, sometimes called disassociation. Some people pronounce it dissociation. Guess what? Despite being corrected many times for each of

those pronunciations, I checked with my colleagues who are experts in dissociation or disassociation, and guess what? They're the same thing. Tomato, tomato, potato, potato. So I'm going to say dissociation. Some people will say disassociation, like I disassociate. Other people will say I dissociate, okay? Both of those refer to essentially the same thing. Dissociation is often talked about in the context of a negative event. And indeed, dissociation is unfortunately, or, I should say, is adaptively associated with traumatic events. In particular, violent or sexual trauma, people will report feeling out of body or out of the experience during the experience or during a recollection of the experience. Dissociation has also been described in terms of people who are in a traumatic accident or they see someone killed right in front of them. First responders will talk about dissociating when they arrive on a scene. I don't want to provide, you know, gruesome imagery here 'cause I know people can be pretty sensitive to this, but, you know, showing up on the scene of a car crash and just seeing carnage or incredible damage to bodies or, you know, this sort of thing. Dissociation lies at the opposite end of a continuum with interoception. Now, earlier, I said that interoception is on the opposite end of a continuum with exteroception, but it also is on the opposite end of a continuum with dissociation. We can provide some better definitions perhaps to make this crystal clear, and here, I'm actually reading from an upcoming review. I feel comfortable reading from it because I'm an author on the review. But nonetheless, interoception refers to a process by which your nervous system, meaning your brain and connections with your body, senses, interprets, integrates, and regulates signals originating from within the body, and thereby provides a moment-to-moment mapping of your internal landscape at both a conscious and unconscious level. Okay, that's a lot of words to describe basically the process of perceiving what's happening at the level of the surface of your skin or inward. Dissociation can be thought of as the opposite of interoception. It's a lack of bodily awareness or a removal of one's conscious experience from one's bodily experience and awareness. Again, this is most often talked about in the context of something traumatic, but really, if we think about health and mental health and physical health, the optimal place to reside on the continuum between interoception and dissociation is somewhere in the middle. We don't want to be dissociated from life's experiences, but we also don't want everything that happens in the world to profoundly impact our heart rate and our breathing. We'd be yanked around by every experience. There are instances in which being yanked around or pulled into an experience is something that we desire and want, like seeing a movie that we want to see or, for

instance, clinical hypnosis or falling in love, wonderful experiences and sometimes also sad experiences, right? Being able to feel one's feelings depending on life's events is important. But being too dissociated or being too feeling, that is, feeling so much in response to everything that happens is also problematic. There are certain people, for instance, that have challenges with what's called narrative distancing. That is, they see someone in a movie getting hit and they almost flinch as if they are getting hit. They see someone who's scared or happy in a movie and they feel scared or happy in a way that seems like they're along for the ride a little bit too much. This is important because what it speaks to is the ability for that... Remember way back at the beginning of the episode, that ACC, that anterior cingulate cortex and the insula. We've got a prefrontal cortex that can say, hey, let's be rational. That movie, that person who's happy or sad, that person in your environment who's breaking down crying, yes, they're sad, it's important to be sympathetic, maybe even empathic towards them, but let's not get pulled into the experience so much that we lose ourselves. And then of course there are areas of your brain that are also leaning on, and here I'm using metaphor, but they're leaning on the insula and ACC and saying, hey, there's somebody that I care about that's upset, I'm also going to be upset, or somebody I care about is happy, I'm also going to be happy, or they're scared so I'm also going to be scared. So it's a push-pull between our recognition that we are each distinct entities and also, of course, the very healthy desire to be attached to others' experiences and the experiences around us. So why am I raising yet another continuum, right? We already have the one continuum of interoceptive-exteroceptive awareness. Well, if we want to think about how meditation can serve our mental health and our ability to focus, there's a very particular mental model that we can arrive at that incorporates this interoceptive-dissociative continuum. Again, if you are extremely interoceptive, you're feeling everything in your body, and those feelings in your body nearly completely account for all of your experience if you're at that far end of the continuum. On the dissociative end of things, you can see what's going on, you can react to what's going on, but your bodily response to that is essentially shut down. You could either be paralyzed shut down, so kind of no movement, or you could still be engaging in behaviors but you're dissociated. Again, sadly, this is often what victims of trauma report, that they are able to just go through the motions but just shut off their emotions or their emotions just shut off. They aren't feeling the elevated heart rate or breathing. Sometimes they can even be quite scared, but they're not even perspiring

## 01:47:43 Model of Interoception & Dissociation Continuum

or showing any signs of autonomic arousal, that is, fright or stress or panic. So let's talk about this model of interoception and dissociation and then a meditative practice that can be used to try and anchor us at the right location or the healthy location along that continuum. Let's first imagine the ideal mental health state. And here, I want to acknowledge, nobody achieves or at least maintains this mental health state. I want you to imagine that where you are along this interoceptive-to-dissociative continuum is like a ball bearing, or you represent a sphere that can roll back and forth along the continuum. At one end, you have pure interoception, you're just feeling everything. At the other end, you're completely dissociated. Well, in this one version of mental health, we take that continuum and we fold up the sides so that it looks like a V, okay? On one end, you have interoception. On the other end, you have dissociation. I realize a number of people are listening to this and not watching this on YouTube so they can't see that my hands are now, the heel of my hands are together, the fingers of my hands are apart so it looks like a V, and you are like a ball bearing. Your state is like a ball bearing at the base of that. You are in a trench of perfectly balanced interoception and dissociation, so you can feel things, you can register what's going on in the outside world, but your feelings are not overwhelmed or overtaken by what's happening in the outside world. You are in a perfect place of being able to make rational decisions and yet still feel your feelings. Wouldn't that be lovely? Wouldn't that be lovely if we could be like that whenever we wanted to? And frankly, nobody is like that all the time. More typically, the model of mental health and mood and well-being and perception of self versus others and internal versus external states is one of more of a U, a U shape, where at one end, we have interoception, and at the other end, we have dissociation, and it's kind of U shaped, and your state is more or less like a ball bearing at the base of that U that, you know, it gets pushed from side to side. Maybe, you know, your heart races a little bit because of something bad or good, and that ball bearing shifts towards interoception a little bit more and you notice that your heart is racing. Or perhaps, at any given moment, you know, your mind drifts a little bit while watching a movie or while talking to your partner or while your child is complaining about something and you're thinking about something else, and that ball bearing shifts towards the dissociative state a little bit. That is a mild form of dissociation. And I think most people would agree that being mentally healthy would

involve this kind of U-shaped model as well, where it kind of can shift back and forth, but it's not extreme. You're not going from interoceptive-biased all the way to dissociated in any kind of extreme way. The ball bearing stays down near the base of that U. Then, of course, there are states that we all, frankly, go into from time to time where the continuum of interoception and dissociation is essentially flat, where you are a ball bearing at one location or another, depending on whether or not you're watching a movie that you're very engrossed in or you're in a conversation with or in an activity with your partner or a friend, et cetera, that has you very engrossed, maybe matching their state, right? There are a number of states you can imagine where matching one's state is actually healthy and good, and then there are a number of conditions in life and situations in life where being matched to someone else's condition like you're getting yelled at and they're angry so then you're getting angry, and then pretty soon, you know, you're not in the best place along that continuum. And I think that for many people, they find themselves somewhere along that continuum. And a number of practices, including meditation, including exercise, including getting a good night's sleep, including therapy, including journaling, including just doing activities like social engagement that you enjoy, are designed to sort of bring up the edges of that flat continuum into more of a U or concave shape so that that ball bearing, meaning your state of awareness and your state of feeling your own feelings versus paying attention to what's going on around you, is somewhere, again, biased toward the middle. By curling up the edges of that continuum on either end, it biases that state toward the middle. And then, of course, there's the extreme that I think almost everybody would agree is more or less pathologic, which is one in which that continuum is no longer shaped like a deep trench like a V, it's not shaped like a U, it's not flat with the edges curled up a little bit or even flat. It's actually now convex. It looks like a mountain shape, a peak, and that little ball bearing at the top can either drop all the way to one side of pure interoception, just feeling beyond any ability to pay attention to anything else, just feeling one's feelings, being angry, being sad, or even happy, right? Being so extremely happy or manic that you can't pay attention to the fact that it's totally out of context, right, inappropriate for what's going on around you, or dropping to the other side of the continuum where you're so dissociated that you're not engaged with what's going around you. You're truly, quote, unquote, checked out. That shape is one that I think almost all clinicians, if not all clinicians, and most people would say is pathologic because you are either completely checked out or you are completely absorbed in what's going on within you or around you. That mental

model that I just created is a simple mental model. It is by no means exhaustive, but it does incorporate a lot of what we think about when we think about mental health and we talk about the ability to be mentally stable, to feel one's feelings, but to still be actively engaged in what's happening around us. And again, it's a continuum that spans from interoceptive awareness to dissociation where the extremes are pathologic and somewhere in the middle is healthier,

#### 01:53:39 Meditation & Dissociation: Mood, Bias & Corresponding Challenge

and then there are practices that bias us toward being in the middle by default. What are those practices? Well, we know for sure that being sleep deprived, for instance, tends to take us away from that trench shape or U-shape continuum or even flat continuum and starts to make that continuum more convex. It tends to make us either feel like we're completely checked out and exhausted or that we are completely labile, we are yanked around by whatever experience is happening, we are just not able to manage. So sleep is, as I always say, the fundamental or foundational layer of mental health, physical health, and performance because it tends to put us in a healthier place. That is, when we're getting enough quality sleep consistently, it tends to put us in the middle of that continuum. Sleep deprivation does exactly the opposite. It pulls us apart. And when I say pulls us apart, that's not a real term. What it does is it tends to make that continuum less concave, right, less bowl shaped, and more convex, more hill shaped, if not a peak mountain shape where it drops us to one side or the other. In addition, a meditative practice done regularly, because it can allow us to become more interoceptively aware or it can allow us to become more exteroceptively aware, which is really just another form of dissociation, again, dissociation isn't always bad provided it's not at the extreme, a meditative practice can actually teach us to deliberately move along this continuum. So this is something, again, that hasn't been discussed a whole lot in the literature. It's been discussed, I should say, in pieces in different literatures. If you look in the clinical psychiatry literature, there's a wonderful collection of studies and reviews that will say that interoceptive awareness is terrific except for the person that is so aware of their internal functioning that they are not able to engage in the world. Similarly, you'll find a beautiful literature, research and clinical literature, that will say that dissociation is terrible in the case of trauma. In fact, it can put people in positions of repeating a behavior over and over that's damaging to them, but because they can disengage or

they're dissociated from it that they continue the behavior, or dissociation can be very adaptive and beneficial if it allows people, for instance, to create some narrative distancing so they're not getting pulled into every argument, or if someone screams at them, they don't necessarily think that it's their fault. They are able to say, "Hey, wait," you know, use their prefrontal cortex and say, "Hey, wait, like, just because you're upset does not mean that I did something wrong. Let's look at the evidence rationally." Okay? So in thinking about the positive effects of meditation on mood, there are two aspects that are important. The first one we talked about earlier, which is being present to one's experience correlates with increased happiness. Having your mind wander, having your default mode network be one of mind wandering actually is correlated with being more unhappy. That was the earlier study that we talked about, that study published in "Science." Now, of course, meditation can make us more present, but if we do not pay attention to whether or not we are becoming more present to interoception or exteroception, that is, to interoception or dissociation, and we don't pay attention to whether or not our bias is one of dissociation versus interoception, we don't know where we are on the continuum, well, then the meditation actually can make things worse, not better. In other words, if you're somebody who has a tremendous amount of interoceptive awareness, well, then meditating on your internal state may not be good, and actually, there's some evidence that it may actually be bad. I'll give you one little tiny example. I've talked about this previously on the podcast, but in that very study from Wendy Suzuki's lab showing that 13-minute-a-day meditation is beneficial for focus, mood, et cetera, it's also very clear that for a number of people that do that typical third eye meditation for 13 minutes a day, if they do that too close to sleep or when they want to go to sleep, they have a hard time falling asleep, which makes perfect sense because they are becoming more interoceptively aware, they are ramping up their level of focus. A meditation practice typically is a focus and refocus practice, and falling asleep involves turning off your thoughts and your focus and focusing purely on sensation, and then your thoughts kind of fragment and you drift off to sleep. This is why I'm a big fan of using non-sleep deep rest or yoga nidra. We will provide links to non-sleep deep rest and yoga nidra protocols. I've talked about them on the podcast before, but those protocols are not meditation per se. They tend to have people defocus, they are anti-focus practices, whereas meditation tends to be a focusing practice. Along those lines, a meditation practice that is one that is exteroceptively biased, where you focus on things that are outside your body, can be wonderful for somebody who tends to focus too much on their

inner landscape and their inner narrative, et cetera, it can help get them out of their head and body, which can be very beneficial. But for people that are not in touch with their emotions, aren't in touch with how they feel, it actually can drive them down the exact path that's wrong for them. So today's discussion is about meditation, and we want to make sure that we are parsing meditation in a rational way that matches the neural circuitry involved and, more importantly, for sake of practical purposes, that you are asking yourselves the right question. Are you interoceptively or exteroceptively biased? Do you tend to dissociate, or do you tend to sort of feel everything in a big way, right? I've heard this term of, you know, hypersensitive people or things that sort, and, you know, some of those are clinical terms, some of them are not. But you need to assess this, and you also need to assess where you happen to be at on a given day, which will be dictated, of course, by how well you slept, life experience, et cetera. So this interoceptive-to-dissociative continuum is one that you need to address prior to any meditative practice. And, again, the solution or the answer of what to do in response to your answer of whether or not you are more inward focused or outward focused, again, is very simple. Just do the opposite of where your bias lies. That is, if you're tilted towards interoception, do an exteroceptive focused practice. If you are more dissociative and you're... That sounds sort of pejorative, it sounds bad, right? But, again, if you are somebody who is more focused on events outside your body and you want to gain more interoceptive awareness and feeling state, if you will,

#### 02:00:18 Meditation & Sleep: Yoga Nidra, Non-Sleep Deep Rest (NSDR)

well, then you want to do a practice that's third eye center practice or breathing focused. One of the reasons that many people meditate is that they've heard before or they've experienced that meditation can replace sleep or can reduce one's overall sleep need. So that's an interesting set of questions, and it's one that I dove into the literature to pursue an answer to, and I came up with an answer that was frankly a little bit complicated on the face of it but boils down to some very simple protocols that I think any and all of us can leverage in order to sleep better and maybe even reduce the total amount of sleep that we need, something that I think most people would want. You know, I realize that we all probably should enjoy sleeping, I certainly do, but that it's hard to get enough sleep, and wouldn't it be wonderful, for instance, to be able to get by on a little less sleep and still feel alert and rested? First of all, I want to point to the recent



study, and, again, this is one that I've raised a few times and we'll post a link to it, entitled Brief, daily meditation enhances attention, memory, mood, and emotion regulation in non-experienced meditators. This is the work, again, from Wendy Suzuki who was a guest on the Huberman Lab podcast, who is now the Dean of Arts and Sciences at New York University and has run a laboratory focused on memory for a long time, is a terrific neuroscientist and researcher and teacher, et cetera, and was a terrific guest on the podcast. I keep returning to this paper because they used so many measures, they were very thorough, and the results were really interesting. Again, this is the 13-minute-a-day guided meditation session. I should just mention that the control group in this study listened to a podcast for 13 minutes that did not improve attention, memory, mood, emotion regulation, et cetera, as much as meditation did, which is not to say that podcasts aren't useful. I won't mention which podcast they used. Fortunately, it was not the Huberman Lab podcast, which I like to think at least increases understanding of certain key concepts of science and science-based tools. You're welcome to look at the paper and see which podcast they used. It's a quite well-known podcast, which is an interesting podcast, but it didn't change the brain in any fundamental way in this 13-minute session, whereas 13 minutes of daily meditation did. And, again, something I mentioned earlier but very important to reemphasize now is that they mentioned that if people in the experiment meditated too close to bedtime, they had trouble sleeping, again, which makes sense because meditation, at least in its most common form, in the form used in this paper, is a focusing and refocusing exercise. Falling asleep involves focusing less. There are other studies, however, that have shown, or that asserted, rather, that doing two 20-minute sessions per day of meditation can reduce the need for sleep. Those results are debated. First of all, understanding what sleep need is is very individual, and determining what people can manage on, meaning some people can manage to get by with six hours of sleep but would do better with eight, some people would actually manage probably better in terms of focusing and alertness if they slept a little bit less because they might be waking up midway through a sleep cycle. If you want to learn more about this, you can check out any one of three different episodes that we've done. One is Master Your Sleep. You can find that at [hubermanlab.com](https://hubermanlab.com). Everything is timestamped in that episode. The other is Perfect Your Sleep. And then, of course, we've done episodes on sleep with expert guests like Dr. Matthew Walker from UC Berkeley. All of those can be found at [hubermanlab.com](https://hubermanlab.com) in all formats, they're all timestamped. With that said, this assertion that has been made many

times over and certainly in the popular press that regular meditation can reduce one's overall sleep need is controversial for the following reason. Some groups find that indeed that is the case, and the interpretation is that the stress reduction that's brought about by regular meditative practice, and in this case, very regular, it tends to be one or, more typically, two 20-minute-per-day meditation sessions. That's quite a lot, I think, for most people. I mean, if you think about 40 minutes, isn't that much time overall, but very few people will stick to that twice a day, 20-minute meditation practice very consistently. Well, the idea is that the stress reduction, which is clear and not debated, brought about by that type of meditation practice is good at offsetting some of the cortisol increases associated with reduced sleep and leading people to be able to function cognitively and physically better on reduced sleep than they would had they not been doing the meditation practice. So the simple way of putting this is that if people meditate regularly, that's reducing stress. The reduction in stress is reducing cortisol. Again, cortisol is healthy, but it should be restricted to early part of the day. You don't want too many peaks in cortisol, especially not late in the day. By meditating, you get the healthy pattern of cortisol release, you sort of inoculate yourself somewhat against the unhealthy pattern of cortisol release, and as a consequence, either the sleep that people get is deeper and/or the total amount of sleep that they need is reduced. Now, a lot of people took that result and interpreted it as saying, well, if you can't sleep, then you can just meditate. So one night, you don't sleep or you have trouble sleeping, you just meditate the next day and you'll be fine. Well, certainly that is not supported by the literature. However, there is a practice, and, again, it's one that I've talked about on this podcast many times before, but if you haven't heard me talk about it, there's a practice called yoga nidra, which literally means yoga sleep. It is a practice of doing not so much a focused meditation, but more of a body scan focusing on the sensation of the body and actually trying to turn off that prefrontal cortex or reduce its activity. Yoga nidra scripts can be found on YouTube and elsewhere. They are paralleled by a similar practice that I've talked a lot about called NSDR, or non-sleep deep rest. I put one out into the world, a short one that's 10 minutes long. You can just simply go to YouTube and put in NSDR and my last name, Huberman, and there's one there. Again, all of this is completely zero-cost. Yoga nidra and NSDR have been shown in a fair number of studies, not as many as been done on traditional meditation, or I should say third eye centered meditation or mindfulness meditation, but have been shown to replenish levels of certain neuromodulators like dopamine and reduce cortisol, reduce a stress hormone at least as

much and, by my read of the literature, significantly more than with traditional meditation. And there's a nice paper that we will provide a link to which is entitled Yoga nidra practice shows improvement in sleep in patients with chronic insomnia: A randomized control trial. Basically, this study looks at, as the title suggests, people with chronic insomnia, although the results certainly carry over or would carry over for people who don't have insomnia. The key result, I believe, in this paper, although there are many, is that, quote, "Salivary cortisol reduced statistically significantly after yoga nidra." What do I mean by that? There was a statistically significant reduction in cortisol levels, the stress hormone, immediately after the yoga nidra practice that we believe would be paralleled by a very similar if not equivalent practice of NSDR. NSDR is a lot like yoga nidra but removes a lot of the kind of, let's just call it the sort of mystical language and the intentions. It focuses more on the physiology and the body scans. You know, I want to acknowledge that yoga nidra has been around for thousands of years and was certainly there before NSDR. I also want to acknowledge that, and this was brought up also in "Altered Traits," that sometimes language can be a barrier toward people embracing practices. In fact, this was recognized by Jon Kabat-Zinn when he created what he called mindfulness-based stress reduction practices, or MBSR, which was simply mindfulness meditation to reduce stress, but he called it MBSR, mindfulness-based stress reduction, as a way to bring it into the clinics that would otherwise perhaps be averse to something called mindfulness meditation. Again, this gets more to the sociology and the cultural aspects than it does to any specific utility of one practice versus another. Here's the takeaway point. If you want to get better at falling and staying asleep or falling back asleep if you wake up in the middle of the night or if you are generally challenged with sleep issues, an excellent behavioral practice for which there are terrific data, meaning data that show that a stress hormone, cortisol, can be significantly reduced as well as certain neurotransmitters can be replenished as well as, and this is key and covered in this paper that I've mentioned a few moments ago on yoga nidra, that the total amount of sleep that you need can be reduced, at least somewhat, well, then yoga nidra or an NSDR practice done, frankly, any time of day is going to be beneficial. Whereas if your goal, I believe, is to increase your ability to focus, to improve your mood, and, perhaps most importantly, to be able to maneuver yourself in a deliberate way along that interoceptive-exteroceptive or interoceptive-dissociative continuum that we've talked about so much, and to really shift your default mode network from one of being a mind wanderer to somebody who can focus and who frankly

is happier, well, then a more traditional third eye center type meditation or a more traditional exteroceptive-focused meditation would be beneficial. Again, which one of those you choose, either focusing inward or focusing on a point outside of you, again, should be dictated by whether or not you tend to be interoceptively biased or exteroceptively biased. But if you want to get better at sleeping, you want to get better at falling asleep, and you want to replace sleep that you've lost, I put that in quotes so that my colleagues like Matthew Walker don't come after me with... What would you come after me with, Matt? Probably with an alarm clock and, I don't know, blankets and a pillow or something of that sort. In all seriousness, it's very clear that replacing sleep that we've lost is an area of research that's still active and ongoing, but NSDR and yoga nidra are very promising, if not downright useful, for replacing sleep that you've lost. Certainly the small amount of data that exists now point to the fact that they are, not the least of which is a beautiful study published out of Scandinavia showing that a 30-minute yoga nidra aka NSDR practice can replenish levels of dopamine, which puts people in a position to be more action-oriented and focused, et cetera, when they come out of the yoga nidra, so certainly a very useful practice. It's a form of meditation, we could call it meditation-ish, but yoga nidra and NSDR are not typically what people think about when we talk about meditation. Of course, this is an episode about meditation. The reason I bring up yoga nidra and NSDR is that many people meditate to enhance their sleep ability and to reduce their total amount of sleep need. It appears that meditation is probably not ideal for that in comparison to yoga nidra and NSDR, but meditation is excellent, if not superb, for adjusting the default mode network toward more happiness by being more mindful and present

#### 02:11:33 Choosing a Meditative Practice; Hypnosis

and for placing oneself in that healthy model of interoceptive-dissociative continuum. So we've covered a lot of information, and I like to think that I've given you some key decisions to make in developing a meditative practice. The most important one, of course, being what will you do regularly? And maybe you're somebody who just answers that question by saying, "Look, I'm not going to meditate regularly. I just want to do the thing that's going to allow me to feel rested when I'm tired and is going to allow me to adjust my state of mind when I'm not where I want to be for whatever reason, too anxious or too exhausted, et cetera." And for those people, I would say a practice like

NSDR or yoga nidra will be immensely beneficial, as will a more traditional form of meditation. I also want to just remind everybody that an app that guides meditation, also with some information and some intention setting, such as the Waking Up app from Sam Harris can be immensely beneficial. I've certainly found it to be beneficial. I know millions of other people have as well, so I encourage you to check that out. We've talked about determining where you are on these continuums of interoception and exteroception in order to dictate what particular type of meditation practice you should do in a given moment, whether or not you should focus your vision inward with eyes closed or focus your vision and your attention outward being a key component, whether or not you should do cyclic breathing, which will allow your focus to be off your breathing somewhat easier than if you do non-cyclic breathing, if you're doubling up on inhales or exhales, whether or not your breathing is going to be natural or not. And, of course, you need to determine whether or not your meditation practice is designed to enhance your level of focus or to relax you. I would say that if it's designed to enhance your level of focus, that doesn't necessarily mean that it won't be relaxing. You could do slow cadence breathing and third eye meditation, it could be very relaxing, and yet it's a focus and refocus practice, whereas something like yoga nidra and NSDR is going to be more along the lines of replenishing yourself, replacing sleep that you've lost, or maybe even reducing your sleep need. On previous podcasts, I've talked about hypnosis, and particularly the episode with Dr. David Spiegel, our associate chair of psychiatry. I don't want to get into hypnosis now, but just understand that hypnosis is distinct from breathwork, from yoga nidra, from NSDR, and from meditation even though it includes some of those components like focusing your attention, it involves actually directing your visual attention outward then inward to go into the hypnosis, it involves some breathing of a particular kind, it involves a specific imagery, et cetera. But hypnosis is distinct because hypnosis is really designed to fix or address a specific problem, whereas meditation, NSDR, yoga nidra, et cetera, typically are not. They can help fix problems such as anxiety, sleep issues, et cetera, but they generally are not directed toward a particular line of thinking. They can be, but typically they are not. Whereas hypnosis almost always, especially in the clinical context, not stage hypnosis, but the clinical context for which there's a lot of research to show it can, for instance, help with quitting smoking, literally a quadrupling of the effectiveness for smoking cessation with something like the Reveri app than if people just try and go cold turkey or for reducing insomnia or for reducing pain or for any number of things, including trauma, et cetera, hypnosis is really

great at dealing with specific issues

02:14:53 Tool: Space-Time Bridging (STB)

and problems and tackling those. Meditation tends to be focused on other things, no pun intended. I'm guessing some of you are probably wondering where to start or, if you're already an avid meditator, where to go with all this information. For that reason, I just wanted to offer you a particular form of meditation that incorporates all of the features that I've talked about up until now in a single meditation practice, and it's a meditation practice that, for lack of a better name, I called STB, or Space-Time Bridging. And the time component has to do with a very simple fact, which is when we focus our attention, visual attention or otherwise, on things close to or within our body, we tend to be fine slicing time. You could sort of think of your breath as more or less the second hands on your clock of existence, whereas when we tend to focus on things far away from us, we tend to parse or carve up time within bigger bins. If you've ever seen a airplane flying at a distance, it looks like it's moving very, very slowly. If you were right up next to that airplane, it's probably going 500 or 600 miles an hour, it would go by very quickly. This is not a coincidence. Believe it or not, how you slice the time domain of your life and your experience has everything to do with your vision, and the closer things are, the more finely you slice up time. The more closely your attention is placed on yourself, the more closely you slice up time. If you focus your visual attention very far or you think about the other side of the world, for instance, and you envision that, well, then you're actually slicing time more broadly. Hopefully that makes sense. Fine slicing would be like slow motion, higher frame rate. Looking in the distance, you're actually taking bigger time bins. So even though things look like they're moving more slowly, it's because your fidelity, your precision of measuring time is actually not as good. It's as if you only have the hours hand on the clock so it seems like it moves very slowly. Hopefully that makes sense to you. So there's a meditation practice that I call Space-Time Bridging that incorporates everything that I've talked about today. It balances interoception and exteroception, it balances interoception and dissociation, and it crosses the various time domains that the brain can encompass using vision. And it's a very simple meditation, it's one that I've been doing for years, and it's one that we're starting to do some research on, but I'm just going to share with you because I think it's actually quite fun and can be quite informative. In fact, people have told me that it can even lead to some

interesting insights both during the meditation and outside the meditation. It's very simple, what you do, ideally you would do this outside or at a window, but what you do is you essentially close your eyes. I'm not going to do this now, I'm not going to close my eyes and do the meditation, but I'll describe it. You close your eyes and you focus your attention either on your third eye center or your breathing, and you try and put 100% of your perceptual awareness onto your breathing or your third eye center for the duration of three breaths, okay? So you're 100% or trying to be 100% in interoception. Then you open your eyes, you focus on the surface of your body someplace. I find that holding out my hand at sort of arm's distance and focusing on the palm of my hand and focusing there visually, so I'm splitting my attention now between my hand, and I'm also going to pay attention to my breath for the duration of three full inhales and exhales while also focusing on my hand, so you're splitting interoception and exteroception as best you can, about 50/50. Then you subsequently look at some location in your immediate environment, maybe 10, 15 feet away, and you focus your attention on that location while also splitting your attention so that you're still paying attention to your breathing, you do that for the duration of three breaths, but now you are in exteroception and interoception. Then you focus your attention at some distance further away, maybe the furthest distance you can see. Now, this is why it's useful to do out of a window or on a balcony or outdoors. You focus on the furthest point, maybe a horizon, some furthest point for the duration of three breaths while also paying attention to your breathing, and sort of imagine a bridge between the two if you find it to be challenging to focus on both. And then, and this is where it can be a little tricky, but then what you actually focus on is the fact, and this is not an imaginary thing, this is a fact that you are a tiny spec on this big ball that's floating out in space, right? The Earth that's floating out in space. And you try and focus on your three breaths while also acknowledging that you are a small body, literally, on this very seemingly large body, the Earth, but that's floating in a much larger, larger, expansive place, the universe, and you do that for three breaths. And then you close your eyes and you go right back into interoception, and you do that for three breaths. You focus on your interoception for three breaths. And you might want to march through these different locations a few times or back and forth if you like, but typically, I will just do it for one segment at pure interoception, palm of hand, some distance in front of me, horizon, whole globe, universe thing, back into body, et cetera. Why is this useful? Why would this be useful? Is it at all interesting, or is this just some crazy idea? Well, the reason it's useful, I believe, is that it has you deliberately step your awareness,

your perception through every position along that interoceptive-exteroceptive continuum. Now, I did say to remain connected to, as they'll say in the yoga classes, aware of, I guess would be the more scientific way to state it, aware of one's breath, but if you wanted, you could actually try and put your awareness completely outside yourself, but most people will find that challenging to do if they're already paying attention to their breath. It's just hard to do, so I find it easier to just split my awareness from interoception to exteroception. But by stepping through these different locations and then deliberately placing your perception, your awareness back into pure interoception, what you do is you essentially are practicing or exercising this incredible ability that the human mind has to deliberately place your perception at specific locations along the interoceptive-exteroceptive continuum. And I think this is very useful because many of us, including myself, tend to get locked at one location along that continuum. For instance, if you're scrolling your phone for a long period of time, you may forget about your bodily sensations, but you generally forget about other things going on in the world. Or if you're very focused on things out in the world, you oftentimes can forget about your internal sensations and what's going on internally. And being functional in work, in life, in relationship, and in all aspects, including your ability to fall asleep, involves stepping yourself along these different locations, which, again, are not just physical locations of third eye center or your breathing or your hand or horizon. Those are just stations within space. But remember, each one of those, just by way of how your visual system and the time domain are interlocked with one another, sets your mind in a particular time domain. And so much of what involves being a functional human being involves dynamically adjusting our attention from what we are doing on our computer to a question somebody asks and then back again, or from text messaging to listening to a lecture or a podcast or from listening to a lecture or podcast and then going back into a mode of commuting, but making that commute either relaxing or maybe do work on your commute or connect with family or friends, et cetera. So much of the fatigue of life and the, I should say, the maladaptive behaviors and emotions that show up in life are really not about any set of behaviors or emotions being wrong or right, but rather inappropriately matched to the space-time domain that we're in, which, again, is just fancy nerd speak for saying being present and being mindful is a wonderful byproduct of a meditation practice, but it is but one of those stations along that space-time continuum. The key element here is to step yourself through a practice deliberately so that you are flexibly and dynamically able to engage in conversation, then disengage and focus, or



focus and then disengage from the work you're focusing on and actually have a conversation or be in the world and move out of that interoceptive awareness to one in which you are dynamically engaged with the things around you. I realize this might sound a little bit vague. For that reason, I encourage you not to think about it too much, but rather to try the practice, see if it works for you. If it doesn't, that's fine. I think it is a good one for people that find that a third eye center or breathing-focused interoceptive meditation might be enjoyable to them or very beneficial to them, but they might want to try something new, and other people who might find that that tends to put them too much in their own head. I think it also ought to be very useful for people that tend to be overly exteroceptive, more on the dissociative end of the continuum, and need to bring in a bit more of interoceptive awareness, but either can't do that or are uncomfortable doing that because they're simply not interested in or comfortable with feeling so much of their internal state because that can either be overwhelming or that's just simply not the way they want to feel. Now, as we round up, I do want to acknowledge that there are an enormous number of rooms within the house, or rather, I should say, within the castle that is meditation, including, for instance, intention setting and mantras and an enormous number of different features of meditation practices that we simply did not have time to go into and/or for which the research on is not completely ironed out yet. And for that reason, in future episodes in not long from now, I'm going to be sitting down with experts in meditation that include neuroscientists and clinicians, but other experts in meditation that certainly are versed in those topics, and where they can't point to specific research studies can certainly point us toward the utility of things like mantras and intentions as they relate

02:25:00 Zero-Cost Support, YouTube Feedback, Spotify & Apple Reviews, Sponsors, Social Media

to getting the most out of a meditative practice, so I eagerly await those conversations, and I hope you will join me for those as well. If you're learning from and are 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. 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 you'd like to suggest future guests for the Huberman Lab podcast, please put those in the comments section on YouTube. We do read all the comments.

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