### Your Mind on Good & Bad Sleep, with Dr. Lauren Whitehurst

0:00:04.4 Ava Ma De Sousa: Welcome to Minds Matter. I'm Ava.

0:00:06.6 Beth Fisher: And I'm Beth and on Minds Matter, we explore research that is related to psychology and neuroscience and occasionally talk about our own personal experiences.

0:00:13.0 Ava Ma De Sousa: This episode on Minds Matter, I interviewed Dr. Lauren Whitehurst, who is an assistant professor at the University of Kentucky in the psychology department. We talked about her research on sleep. Most of us know that sleep is good for us. But maybe we don't know why exactly it's good for us. And Dr. Whitehurst told us about the body and the brain and how they interact to support vital functions in memory, and insight and creativity. We also talk about sleep equity, and what happens when certain communities systematically get worse sleep than others.

0:00:44.2 Dr. Lauren Whitehurst: My name is Lauren Whitehurst, and I am an Assistant Professor at the University of Kentucky in the Department of Psychology, and I'm in the area of cognitive neuroscience. And I generally study the role of sleep for health and cognition. I'm really interested in what happens in our bodies and our brains while we're sleeping, ways that we can measure that. But I'm also really interested in the impact of that on our waking life. So how we experience our day, how well we're able to think learn and remember information about our day. And even moving up a step bigger than that, how our sleep might even predict our ability to do those things across our lifespan, how sleep might support our ability to do that really well over time, or how bad sleep or the lack of sleep might make that harder for us over time. I'm also really interested in communities that might not have the same access to really good sleep, what about those communities create those poor sleep conditions, how we can better understand that and then hopefully intervene and support their sleep health, so that they have the same kind of access to good health outcomes as the rest of us.

0:01:48.0 Dr. Lauren Whitehurst: So that's what I try to understand and explore in my research lab. So I do really basic science kind of in the lab. And then I also do a lot of stuff in the field out in the world, to understand sleep, and all of these many interactions with our lives.

0:02:01.6 Ava Ma De Sousa: So I'm assuming that when you tell people who aren't necessarily in the field that you study sleep, that they probably have a lot of questions for you about sleep in general and how it affects cognition. But in the past, you have done a lot of work, specifically looking at the links between sleep, and memory and different kinds of memory. So in a 2016 paper, in particular, you discussed this link, and I was wondering if you could share a little bit more about that paper and maybe the background behind it.

0:02:32.0 Dr. Lauren Whitehurst: Yeah, the first part of that is why study sleep and memory? And I think, why study sleep is actually how I got into this question. So I'll answer that first. Why study sleep is, really, we all do it. It's one of those very ubiquitous behaviors that we all have to do, we often engage in, and that it's really conserved across many species. So it's something that not only we do, but a lot of our fellow mammals, as well as many other vertebrate species, a lot of the kind of water mammals as well as other water species sleep. So it's found all over the animal kingdom. So this really conserved behavior that we all engage with... Yet, we also do it in these really intimate ways.

0:03:11.7 Dr. Lauren Whitehurst: And so sleep is often in your home, in a safe place, sleep is often in spaces where it's best done, where you feel safe and protected. It's often done with loved ones, people that you trust. And so while we all have this kind of global relationship to sleep, it's also this really unique intimate behavior for each of us. And so I find that just in and of itself, an interesting behavior to observe and try to examine. And then obviously, it's linked to so many other things, because it's so conserved and across many species, because it's really prevalent, and there's a lot of pressures keeping it and conserving it.

0:03:50.5 Dr. Lauren Whitehurst: It's highly related and connected to a lot of the other processes that we do, our biological processes that are important for our health, our well being, and our psychological functioning. So that's what makes it really interesting. So speaking about psychological functioning, why I study memory, it's because memory is really the ways in which how we interpret ourselves. It's who we are, that our fundamental core is our memory of the experiences of our past. And it also shapes how we act and move in the future. We rely on our known expectations of the world to then move and shape it going forward. And so I think, understanding how this really conserved behavior, like sleep contributes to that is just again, a kind of fundamentally interesting question for me. And so that's how I started in this field. And that's why I continue to ask those questions.

0:04:39.9 Dr. Lauren Whitehurst: This one paper that you referenced in 2016, it was really this, it started as this kind of swing in the dark. I will be really honest, it wasn't this... I sat down with my research advisor at the time and like I had this like really clear question and was like, "Okay, this is the huge gap and I'm gonna run this study to... " It wasn't like that at all. I actually started graduate school. The lab I was in had already been collecting data on heart rate. And it's actually really normal. So when you conduct sleep studies, we attach electrodes to the people's scalp to understand neural activity in the brain. But we also attach electrodes to their bodies. So we attach electrodes to detect their eye movements, which helps us understand rapid eye movement sleep, we attach electrodes to their muscles, under their chin, or on their arms to understand what their muscle movement looks like while they're sleeping.

0:05:28.3 Dr. Lauren Whitehurst: And then importantly, to this kind of project, we attach electrodes to understand their heart rate activity, their heart activity. And we use electrocardiogram, to help us understand that, and this had been collected in every sleep study, almost ever done, heart activity is always collected. It's not unique to the lab that I was in. But no one had really looked at it in relationship to cognition before. People had mostly said, "Okay, this activity that's happening during sleep, it's really important for things like cardiovascular health, it's really important to understand that." People had looked at blood pressure, other kind of autonomic nervous system outcomes, but no one was really saying, "Okay, what is happening during sleep and how does it relate to cognition?" And I started asking that question, based of some of the research that I had read, where our bodies or our nervous systems are highly engaged in taking in information from the environment.

0:06:16.4 Dr. Lauren Whitehurst: So our sensory organs, our eyes, our ears, our nose, our skin, all of those organs are involved with taking in information from our external worlds, and then taking that and feeding it to our autonomic nervous system, which is basically one of the organizing systems of our periphery. And making sense of it, and saying, "Okay, let's try and kind of code or quantify this information and then send it to the central nervous system, the brain, so that the brain can then really process and understand information using our memories and our experiences, prior to make sense of this new information it's receiving at this moment." And so there had been a lot of literature that suggests that sleep was really important for the kind of making sense of the information, but there hadn't been a lot of information saying what's going on in the periphery during sleep, that might relate to that process. And so that was the gap, and again, it wasn't like this huge thing that I had done a lot of work on prior, I just tripped and fell into this data and was like, "How can I make sense of this data?"

0:07:15.0 Dr. Lauren Whitehurst: And then I went back and did a whole bunch of reading to try to understand some of the theoretical underpinnings of this data that I had. And so I ran some analyses and looked at some of this data and tried to understand this index called heart rate variability or this idea that our heart rate isn't consistent. So a lot of times we talk about our average heart rate, which might be 70 beats per minute or 80 beats per minute. If you exercise, it would be a lot faster rate, if you're sleeping at night or in very calm, rest state it would be a little bit lower. But each of those individual beats that make up that average can vary in how far they are from each other, so that allows us to take an index, a variance of how different each of beats are.

0:07:56.4 Dr. Lauren Whitehurst: Now, if you have a lot of variance in your heart rate, what that really means is that the underlying physiological structures that are controlling your heart rate can very actively come in and out of that control. So the two main systems that control our heart rate is our sympathetic nervous system and our parasympathetic nervous system, which are two of the main branches of our autonomic nervous system. And they both do a really good job of bringing your heart rate up, the sympathetic nervous system does that. When you need more blood to flow through the body. And this parasympathetic nervous system does a really good job of kind of calming your heart rate back down, and because it's tonically active, it actually is always in control of that sympathetic nervous system making sure your heart doesn't ever be too fast for too long.

0:08:38.5 Dr. Lauren Whitehurst: And if you have a lot of variants in your heart rate, that means that those two systems can dynamically act on your heart rate in different ways at different times, and that allows that variance to happen. So you're really responsive and flexible to your external environment, both systems have really good control and can come in and modulate each other whenever they need to. If you have quite low variance, it often means that you have a dominance of one of those systems. So one of those systems that often kind of work, they usually work together, there might be one that's more dominant, so if you have a really high heart rate and that high heart rate is very consistent, that likely means that your sympathetic nervous system is really controlling that and over, and dominating the parasympathetic nervous system.

0:09:21.5 Dr. Lauren Whitehurst: That often happens when we're exercising, but if you're at a rest state, let's say you're just hanging out watching TV and your heart rate is still really high, that might be indicative of cardiovascular disease. Now, on the other side, if your heart rate is really low, tonically low, your parasympathetic nervous system is dominating the other, that might be indicative of a sleep state, a rest state, but it also might be indicative of bradycardia or some sort of other type of condition where your parasympathetic nervous system is taking over too much control and you're having a hard time mobilizing resources by increasing your heart rate when you need to. So that's a short run down into what that physiology looks like, and then why might that be important when you are learning new information, those two systems are dynamically interacting with each other.

0:10:07.1 Dr. Lauren Whitehurst: So when you are bringing in new information, anything novel in your environment, anything in your environment that you hadn't interacted with before, anything in your environment that's exciting to you, new information about a loved one, new information that is self-relevant, learning something new about yourself in new environments, all that information, it's going to require information from your sensory organs to be quantified by the autonomic nervous system through those two dynamic systems that we described and that information to then be passed on to the brain to be made sense of. And so during sleep, one thing that happens that's really awesome is that those systems go, in a sense, go to their homeostatic low points. Really in the space of relaxation...

0:10:52.1 Dr. Lauren Whitehurst: Good thing 'cause we're sleeping, we don't want them to be too active. But they have this kind of constant information flow that's still happening, they're still checking in on the sensory organs, they're still checking in on your peripheral systems, and they're sending whatever information they have to the brain to say, "Yeah, everything seems to be good." Or, "You know what, whatever we need, our breathing rate is okay, our heart rate is okay." And that information is still being integrated and sent to the brain. And the periphery doing that and making sure that the environment is not having these really large impacts on us while we're sleeping, helps to keep us asleep, and so if that is disturbed, if the ANS's input to the brain is disturbed, that can also lead to disturbances in the brains work during sleep, which is often what we call memory consolidation. So consolidating the learning that we did, or the information that we brought in during the day, and so this paper that she brought up in 2016 was really that's the whole background for it, right?

0:11:45.3 Dr. Lauren Whitehurst: It was me trying to ask the question when we're sleeping, does the activity of the autonomic nervous system predict or in a sense contribute to the way that we consolidate our learning during that time? And so for those who might want a little run down on what I mean by consolidate memory is that when we first take in information or we acquire that information, we have to often be in a waking state, our brain has to be in this kind of active brain state where we can take all the information from our sensory organs and then the central nervous system can act on it, our hippocampus is really involved in taking in new information, and our cortex is really in... Our neocortex, is really involved in helping to organize our sensory inputs with the content of the information that we learn.

0:12:30.3 Dr. Lauren Whitehurst: And then when we have quiet times or rest times, and specifically when we have sleep, we can optimally consolidate the information. And why would I say consolidate? Why would I say optimally consolidate? It's that when we are awake and we're taking in new information, it's really hard to spend time in the information that you've already taken it. So when you fall asleep, you no longer have new information coming into the brain, which is allowing you to consolidate and work on and put away the information that you've acquired earlier that day, which allows you to save it so that you can remember it later when you need it. So that's what we would call memory retrieval. At another time when you're in this environment where you need to recall something that you've learned or you need to act on something based off of your previous experience, you're able to do that if you stabilised and filed that information away in the brain. So during sleep states, our brain is optimally suited to consolidate because there's no new information coming in, and there's no demands for you to recall information in the environment.

0:13:29.2 Dr. Lauren Whitehurst: So the question in that paper really was, how does the autonomic nervous system contribute to the central nervous system process? We know all of that consolidation is really happening in the brain, but what is the role of the periphery in ensuring that information can be consolidated well? And so in that paper, what we found was that when we account for cardiovascular activity, particularly that heart rate variability, how flexible our heart rate is, we are able to account for more variance in our performance outcomes than if we just look at traditional central nervous system outcomes that we often contribute, sleep in memory to the... In the Impasse studies. So for example, with our electroencephalography are the electrodes that we attach to the scalp to measure the brain activity that is emanating from the neurons in the cortex.

0:14:19.6 Dr. Lauren Whitehurst: We can extract a ton of different outcomes from that information. So we can ask at what rate are neurons firing at different times throughout the night, and we can also quantify what sleep stage individuals are in by looking at the electroencephalographic data. And when we do that, those sleep stages have often been shown to really be important for memory. So one of the sleep stages is stage two sleep, another one is slow way sleep, those are both non-rapid eye movement sleep stages that are really associated with synchronising of our neuronal firing in our brain, allowing for the conditions for information to be shared across different cortical sites and stored in those different cortical sites.

0:15:03.5 Dr. Lauren Whitehurst: And so those brain states and also oscillations that arise from the neurons that are firing during those states have been associated with better memory outcomes. And so after we account for those memory outcomes that we've seen before, we can still account for more variance in memory when we think about what's happening in the cardiovascular system, when we think about what's happening in our peripheral systems. Which suggests that while the brain is really doing all the processing inputs from the body kind of checking in and sending information to the brain, it's also being considered.

0:15:36.7 Dr. Lauren Whitehurst: I will say the way that I like to think about this sometimes is that at any given time, a body has competing needs, and memory consolidation is one of those needs. It's important, it's adaptive, it's been conserved that we are able as animals, as mammals, as humans, to learn, it's really important that we do that. But that ability to learn new information, consolidate information or whatever you wanna... We wanna think about it, it's competing with other things that the body needs to do. So it's competing with our immune system needs, it's competing with our cardiovascular needs, it's competing with other needs that require biological resources.

0:16:14.8 Dr. Lauren Whitehurst: So if the body at any point during a sleep state, when the brain is busy consolidating, were to say, "Hey, oh my goodness, I'm having some sort of stressor in my heart, is it beating correctly?" There would have to be resources diverted to make sure that heart is beating correctly, or that breathing is happening correctly, or that the gut is metabolising correctly. And so those resources are in a sense always in competition. And memory is just one of those things that requires those resources, so the ANS during a sleep state is really saying, "Everything's good down here." It's sending signals to the brain saying, "Everything's okay down here." And the brain can say, "Okay, great, I can keep on with this business of memory consolidation."

0:16:53.3 Dr. Lauren Whitehurst: But if at any point, the body said, "No, things aren't good down here, we need you to send some information this way," or "We need you to send some signals this way to make sure everything with the body is okay." Then that would probably or likely, theoretically, divert resources away from that consolidation process, in towards something that might take more priority, like ensuring that your breathing is not impacted. And I say that, and I can extend that to suggest that there is some evidence, so individuals who have obstructive sleep apnea where they don't sleep as well because they have collapsing in their airways that obstructs their breathing during sleep, that has also been associated with significant cognitive impairment. And even to the case that people suggest that it increases the risk for things like dementia or the pathological loss of memory over the lifespan. So there is this kind of competition of resources that's happening during the sleep state.

0:17:50.4 Ava Ma De Sousa: So I was just wanting to clarify, are you saying that the body is supporting the brain in being able to do memory consolidation? And when everything is going okay, then it's basically like the brain has free reign to be doing memory consolidation, or is it that there's other types of links where if you're breathing a certain way or if your heart rate variability is higher then you're just better able to consolidate memory for different... Is it just that it's supporting that system?

0:18:15.9 Dr. Lauren Whitehurst: Yeah, I think that's a great question. I don't know that we know the answer to that question right now, but what I can say is that theoretically, and based off of the data that we have, the evidence that we have, it does seem that our nervous system's signalling to the brain is complex, but also really related to this idea that this is going well, the signals that are being released are like, "Okay, the breathing is happening. The heart rate is going." And so if those signals are good and there isn't any peripheral stress, then yes, I believe that the central nervous system can continue to utilize its resources accordingly, it can continue to dedicate time during sleep to something like consolidation.

0:18:58.0 Dr. Lauren Whitehurst: If there are signals of peripheral or physiological stress that it's happening in the body, then the brain is also going to direct resources, the hypothalamus, the thalamus, other brain regions are gonna direct resources to the periphery. And I'm not saying that it's a zero sum, but it likely could impact the consolidation that's happening. And there isn't evidence to suggest that in cases where individuals have peripheral stress, like in sleep apnea, they do experience these cognitive impairments as a result.

0:19:29.9 Ava Ma De Sousa: That's really interesting. I guess I had never thought about it in terms of this idea that the body and the brain are competing to figure out which task should we be focusing on, and they are focusing on it together because so much of the time we think of the brain and the body or the central nervous system and the peripheral as more separate, but that they're actually working in concert. I think it's really easy to forget that sometimes.

0:19:50.8 Dr. Lauren Whitehurst: I will say this is quite theoretical when it comes to how we think about it during sleep. There's evidence, like I said, to support this idea, but it is still quite theoretical, we're still testing this in a variety of ways in my lab and in other labs. And I think I will say there's also some kind of existing health models that help us test this, like sleep apnea is a really good one, but also hypertension is another good model of peripheral stress, and what does that mean for cognitive resources? And you also find that individuals who have hypertension, especially uncontrolled hypertension, they don't consolidate memory as well, their executive functions also take a hit. So there are some models to suggest that, but yeah, so definitely there's a synchrony that's happening between our periphery and between our central nervous system and there's a balance to that synchrony. So they are independent systems, but they work together, they communicate together and they rely on each other to work well. And so if one is out of whack, you can likely see the cost of that in the other.

0:20:42.3 Ava Ma De Sousa: Yeah. The cost that's so direct is just really interesting. I've never thought of it that way. But so is that the way that it's tested to look at this hypothesis of whether it is this cost or it's just a diversion of resources, is looking at issues within sleep or issues within the peripheral system, or are there other ways? I guess, you can't induce someone to breathe badly in the lab while they're sleeping.

[laughter]

0:21:03.6 Dr. Lauren Whitehurst: Yeah, you can't quite induce someone to breathe badly, but you can induce them to breathe better and look at the impact. We also use stimulation in our lab, so we stimulate the vagus nerve during sleep, which is one of the... It's the longest nerve in our parasympathetic nervous system, and it innovates all of our peripheral organs as well as our central nervous system. And the idea is that a lot of the information that is relayed from the body to the brain goes through the vagus nerve at some point. And its synapses onto the brain stem, and as a result, the inputs that are in the brain stem, a lot of them are chemical inputs, so you get a lot of norepinephrine and acetylcholine as a result of stimulation of the vagus nerve. And so we can do... We do that in our lab where we stimulate the vagus nerve and say, "Okay, if you have an abundance of resources, if the vagus nerve is giving you more information to the brain stem, how does that impact upstream cognitive processes?"

0:21:56.3 Dr. Lauren Whitehurst: And so we've conducted studies where we've stressed people out and we stimulate the vagus nerve to say, "Okay, what is the cost of stress if the vagus nerve is intervening on that stressful experience?" We've also... We're running a study currently. That study we just finished up and we're doing some data analysis. We're running a study currently where we're stimulating the vagus nerve during sleep and saying, "Okay, now we have a different physiological state, now the animal is no longer awake and we're now sleeping."

0:22:22.5 Dr. Lauren Whitehurst: And so the conditions of the sleeping brain, the neuro-chemical, the electrical conditions are very different. And so if we simulate during that sleep and during a sleep state, what does that look like and how does that impact the resources that are available? So we don't always have to look at models of deprivation or stress to understand this, we can also look at if we boost the system, if we provide a little bit of an extra punch, what happens? And so we're running some studies in our labs to understand that with data pending, hopefully we can get some output here soon.

0:22:52.9 Ava Ma De Sousa: So just theoretically, with the vagus nerve, I don't know if our listeners have heard of this, and I think it's connected to every major organ in the body. So I have two questions, first is, can you explain how you stress people in the lab? And then when people are then stressed out because the vagus nerve is getting all of this input, I think intuitively, you can think, because it's getting all this input directly into your brain and you get more stressed out because you just feel all of this, but I think it's... Is it supposed to be actually the opposite, that it would actually help people be able to manage that stress better?

0:23:23.5 Dr. Lauren Whitehurst: Yeah, so it's important to think about the multiple systems that manage a stress response. So your first question was how do I stress people in the lab? Okay, so we stress people in the lab mainly using psychological stressors, so we mainly use The Trier Social Stress Test. People are asked to impromptu give a speech, and they're not told that they're gonna give a speech before they come into the lab, and we make them give this five-minute or even sometimes six-minute speech. And then we have people who don't look very kind or nice, stare at them while they give their speech, and people respond that they hate this all the time, they really hate it. We've actually had people drop research studies because they hate it so much. So it's not really fun.

0:24:00.8 Dr. Lauren Whitehurst: And then we also have them after they give a speech, we also ask them really difficult questions. So we'll ask them to do something like subtract in intervals of seven from this really high number, from 900. And people just have to do that on the spot and they get really stressed out about that as well. 7,304, subtract intervals of seven until I tell you to stop. So we mostly do psychological stressors where people are asked to do this kind of public speaking or kind of performance, and then they're graded on it. So there's just this evaluation aspects, people don't like being evaluated and it's often they're being evaluated by strangers who do not know them and won't take their nice personality into account as they're evaluating them. So that's usually how we stress people out in the lab. But going back to your second part of that question about the stress response and how do we like to think about it from a physiological standpoint, it's complicated, it's not simple. The stress response is one of the basic fundamental adaptive things that we as beings have. So this idea that we are able to, in response to either an external or even sometimes an internal stressor, our psychological stressors also impact us quite similarly.

0:25:07.1 Dr. Lauren Whitehurst: So I stick with the external idea. So if you were walking down the street and a car came zooming around the corner, you want to be able to make a decision about your safety. And so our stress response that has really evolved over time to make us better or allow us to do that well. And so there's this mobilization of resources that's really just driven by the protection of being in that moment. So going back to our autonomic nervous system, the sympathetic nervous system is really involved with mobilizing resources. So its job is to have your heart beat faster, increase your blood pressure so that you can get blood flowing through your external limbs at a much faster rate, so that you can mobilize those limbs and run faster than you ever could. So as that car is coming around the corner, if you make that decision that I can cross the street faster than I can go the other direction, you're making that decision on a split second and then run across the street so that you can get out of this crazy car's way. So that is what the autonomic nervous system is really good at, is really mobilizing the blood that you need to make sure that your external organs can move... Your external limbs can move really faster, that your skeletal muscles can move really fast.

0:26:16.1 Dr. Lauren Whitehurst: Okay, but then there's the other part of that, this idea that I need to make a split second decision on what I should do, run across the street or turn back where I came from. That's where the parasympathetic nervous system might come in and be critical. So what you describe, okay, now you have all these resources that are telling you that you're stressed out, what the parasympathetic nervous system is really good at is actually helping you focus your attention and make a decision so that that vagal input gets turned into acetylcholine once it hits the brain stem and norepinephrine once it hits the locus coeruleus, which is also located a little bit above a brain stem. And those kind of mobilizing neurotransmitters are really these kind of excitatory neurotransmitters that allow the brain to fire more action potentials and fire more responses that allow you to make decisions much quicker, allow you to attend, see the different things that are going on in your environment and then drive you across the street or drive you back to where you came from, depending on that decision that you made.

0:27:20.7 Dr. Lauren Whitehurst: So the vagus nerve is really involved with telling the brain that the body is moving, there's this thing that's happening, there's this stressor that's going on. Releasing these neurotransmitters in the brain that allow you to have these faster action potentials, which can help your attention, which in behavioral stands will allow you to have more attention and focus, and that can help with your decision-making. So both of those things, mobilizing the skeletal muscles so that you can run really fast, but also helping you attend to your environment and make a proper decision, are both driven by inputs from the autonomic nervous system, but those inputs are then acted on by the central nervous system.

0:28:00.5 Ava Ma De Sousa: So is the vagus nerve then more related to the parasympathetic system?

0:28:04.2 Dr. Lauren Whitehurst: It is. Yeah. So it's the longest nerve in the parasympathetic nervous system. But what's unique about the parasympathetic nervous system, or the vagus nerve, is that though it is of the parasympathetic nervous system, it can actually receive inputs from the sympathetic nervous system and integrate those inputs in its information that it passes on to the central nervous system. So it's really good at taking something like adrenaline, which is in the body, it's a peripheral hormone, everyone knows what adrenaline is it makes you excited, it ramps up your response, it gets you pumped. But adrenaline, because of the complex nature of it, it can't pass the blood-brain barrier, so it actually can't get into the brain, it has no ability to impact what's going on in the brain, but what the vagus nerve can do is actually take those adrenaline inputs and turn them into noradrenergic or norepinephrine inputs that the brain can interpret. So that is the vagus nerve's role in taking some of that information from the periphery, consolidating information from the sympathetic nervous system and transferring it over to the brain to say, "Oh, we have more adrenaline in the body, here's that norepinephrine, let's fire some more action potentials and get us the attention that we require."

0:29:18.1 Ava Ma De Sousa: That's so interesting. I think it's also a good reminder that... Because I think, when we think about parasympathetic versus sympathetic, we often think of them also as separate and as opposite in some ways, but they're also clearly working together.

0:29:31.6 Dr. Lauren Whitehurst: It's so dynamic. Our systems are not simple, it's good job security that we have so much dynamic interactions that are hard to model, hard to understand. We need more experiments, we need more computational modeling, we need a mixture of really fun science so that we can better understand the human body, and then also better understand how we can protect people that are experiencing pathology, experiencing maladaptive interactions or in as sense experiencing environmental act inputs on the body that are harming the physiology itself.

[music]

0:30:08.9 Ava Ma De Sousa: So one of the things that Lauren mentioned when she was talking about the different branches of the autonomic nervous system, which are the parasympathetic system and the sympathetic system, which just to recap again, the parasympathetic system, we often think of it as rest and digest, and the sympathetic system is more fight or flight. So that calming versus excitability. And so I actually was also in a lab that Lauren was in for a little bit of time, and Wendy Mendez who was the principal investigator of that lab, loves to tell a story about the vagus nerve, which we also talked about, which is that nerve that really innervates all of these organs, and that is key to the parasympathetic system, and it's an explanation for voodoo deaths. So imagine Beth, that we get into an argument. And that I tell you I am a witch and I have these powers, it's almost Halloween, and that I'm upset with you, so I'm gonna put a curse on you and at midnight tonight, you're dead. How do you feel about that? Very scared?

[laughter]

0:31:20.2 Beth Fisher: Pretty scared. [laughter]

0:31:21.8 Ava Ma De Sousa: Okay, so let's say that you really believe that I have these powers, so seeing me for a while and you believe that it's true.

0:31:29.9 Beth Fisher: She's a witch.

0:31:30.9 Ava Ma De Sousa: So one explanation, and I think the intuitive explanation for this kind of thing, because it does happen that people are cursed or something, and then they do end up dying from it. And there is a scientific explanation, and I think intuitively, we might feel like it might be because your body is over-reacting, so you're freaking out so much, your heart's pumping so fast that you give yourself a heart attack or something because of that.

0:31:53.3 Beth Fisher: Yeah, that's what I would think it was. I would think that was the reason.

0:31:58.9 Ava Ma De Sousa: Exactly. Yeah, so let's set the scene though, so you're freaking out, I've put this curse on you, it's now 12:00 PM for Beth, so she has 12 hours until this curse is going to happen to her. So she spends all day freaking out. There's then complete withdrawal of the parasympathetic system and the vagus nerve, so now that system is not acting at all, and her heart is free to beat as fast as possible, her entire body is just freaking out. And it's just like very high stress situation, no calmness, nothing in the body is helping her calm down. So then she's freaking out, heart is beating, sweating, the clock ticks down to midnight and nothing happens.

0:32:40.8 Ava Ma De Sousa: So it's midnight and she's like, "Okay, I'm fine. Look at that, I can relax now." But then, because she is relaxed, the parasympathetic system and specifically the vagus nerve comes back down and clamps down on the heart super hard and basically stops it from beating all together. So that system that was turned off, that's supposed to calm you down, comes in way too hard and completely stops your heart. So that's one explanation for what happens in voodoo curses. So that's another reason that stress can also be bad, is that when you are then able to calm down, your body doesn't know how to deal with it and comes back in too hot and can cause you to die.

0:33:20.6 Beth Fisher: Yeah, that's interesting because you would think if that's the purpose of this, then it shouldn't come on so strong, that happens. You know what I mean? If the purpose is when we can calm down blah, blah, blah, we should be okay, do you think it wouldn't be able to do something like that?

0:33:36.3 Ava Ma De Sousa: Yeah, I think it's... Maybe also speaks to the fact that maybe we shouldn't be that stressed out in general, our bodies aren't made to handle so much stress because our bodies are made to be at a more of a middle ground. So I think that's a good reminder. I'm not sure how often this actually happens in more everyday situations, but...

0:33:56.5 Beth Fisher: Yeah, don't stress, everyone.

0:33:58.9 Ava Ma De Sousa: But just when you think you're fine, so try not to stress out because...

0:34:01.4 Beth Fisher: So just don't be stressed.

[music]

0:34:07.5 Ava Ma De Sousa: So you've also done research looking at how specific sleep stages, so sleeps like REM sleep, which we're probably all more familiar with, and slow wave sleep, how those different types of sleep and stages of sleep affect different types of memory. So I was wondering if you could tell us a little bit more about that research.

0:34:23.3 Dr. Lauren Whitehurst: Yeah, for sure. Okay, so first, I'm gonna start with sleep stages 'cause it's important to get an overview of what those are. So when we go to sleep, a lot of times we think about ourselves just turning off from the environment. I feel like in the last 10 years, people know more about sleep than they probably ever have, because of the watches and the phones and all the apps and all of the me-health apps and stuff that are out there, we know more about our sleep than ever. It's like they're one of the more low-hanging fruit for monitoring. So what people might know is, "Oh, there's this deep sleep and then there's this light sleep." And that doesn't quite transfer over to how we think about it from a research standpoint. What we often think about is sleep in stages, and in these stages we use these categorical definitions or we characterize sleep in these categorical ways.

0:35:05.9 Dr. Lauren Whitehurst: But the most important thing to know is that this is really just a change in a shift in the neuronal firing rates in the brain and the synchrony of those neuronal firing rates in the brain. So as everyone knows, we have this huge brain with billions and billions of cells, and the cells have these different types of characteristics, they have these chemicals that they can release, they also have this firing that they do, and what we often think about when neurons fire, it's like an all or nothing, so they either let off what we call an action potential and they fire and they push their chemical or whatever they want into the extra cellular space, or they don't.

0:35:41.6 Dr. Lauren Whitehurst: And the techniques that we use for in-lab monitoring of sleep, the electroencephalography, does a good job of trying to quantify the temporality or how much, and when these neurons are firing. The EG is not really great with where in the brain, these neurons are originating. They're firing from some newer techniques, including EG with really high density EG. A lot of electrodes are getting better at trying to understand spatial locations, but EG's not the best for that. But what it's great at is telling us a time scale around neuronal firing and that's really helpful for sleep, because what happens is that as you get into different sleep stages, the amount of firing and the neurons that you see changes. And the synchrony between that firing changes. So once you're getting ready to go to bed at night, you're starting to lay down and fall asleep, the first thing that happens is that your neurons start to slow down their firing just a little bit. Just enough to make it so that as you're starting to close your eyes, the things that your neurons often fire to, the kind of shapes and sounds and the environment that neuronal firing can slow down.

0:36:48.9 Dr. Lauren Whitehurst: Your eyes are closed, you no longer see those shapes and you no longer listen to those sounds. And so the neurons can stop firing as much and they start to slow their firing right down quite a bit. And that is how we transition into stage one sleep, and we stay in stage one sleep for about one to two person at a night, it's really just this transition from wake to sleep. Next we transition to stage two sleep, which is a much deeper sleep stage, and say it's a deeper than stage one, but it's not the deepest. We'll get in to deeper sleep stages. And in stage one sleep, our brain starts to shift and we start to have a lot less neuronal firing in those sensory brain regions that we described, that I was talking about before, and so the rates of neuronal firing starts to slow even more and you also have these two really clear signatures that appear during stage two sleep in the EG. The first is a K-complex, which is this really large wave, which has been associated with actually the brain trying to keep the animal asleep. In our lab, if we had someone sleeping in the bedroom and someone slammed the door outside of the bedroom, their brains would actually shoot off this K-complex, this kind of... This kind of check of the brain to say, "Okay that was something outside in the sensory environment. But you know what? This animal needs sleep. And so we're gonna try to like suppress that sensory input and keep this animal asleep."

0:38:09.3 Dr. Lauren Whitehurst: And so K-complex are really associated with suppression of sensory information so that the brain can stay asleep. And all those are these really large scale, high amplitude, low frequency wave. And then the other thing that really appears during stage two sleep is the sleep spindle. And so sleep spindles are these actually really fast frequency waves. They have a very short duration of about one to two seconds and they have this kind of waxing and waning about them. They basically are neurons that are firing about 14 to... About I should say 12 to 16 times per second. So they're firing at a very fast rate, but they only do it for a brief period of time. And we believe that those neurons are originating in the thalamus of the brain. The thalamus is the relay center of the brain. It's really associated with taking sensory information and then distributing it to the normal sensory areas that are used to help with the memory consolidation of that information.

0:39:01.4 Dr. Lauren Whitehurst: So this thalamus kind of stores information temporarily and then sends it to the different areas in the cortex as well as to other brain regions like the hippocampus to help process that information. And so those sleep spindles are really associated with the distribution of consolidation across in the brain. And then after you have stage two sleep for a bit of time you transition into what we call slow wave sleep or stage three sleep. And that is when your brain really starts to slow all the way down. The neuronal firing in your brain starts to slow down and it begins to synchronize so that the neurons across your brain fire at the same time. So it's no longer this idea that like you have some neurons in the front of your brain firing and some neurons on the right side of your brain firing. It's that all of the neurons across the cortex are really starting to fire at the same time and there's silence at the same time. And as a result we have these really large amplitude slow waves that we detect in the electroencephalography. Those large amplitude slow waves are associated with a ton of really important health benefits.

0:40:01.7 Dr. Lauren Whitehurst: They're associated with the clearance of the toxins that build up across the day. There's some new data to suggest that the slow waves facilitate the clearance of extracellular space of those toxins, those toxins that are really important to diseases like Alzheimer's disease. So the builds up of these toxins across the lifespan can lead to something like Alzheimer's disease. Having good sleep at night helps you clear those toxins out so that they are less likely to build up and contribute to pathology over the lifespan. Then the last sleep stage that we rotate into that's really... That people really think is so interesting and cool is rapid eye movement sleep. And so rapid eye movement sleep is your neurons actually change their firing profile and they start to fire faster. So the neurons in the brain actually start to fire a little bit faster than they did before. And this brain stage was the thing that put sleep on the map. It was people were sleeping and then the people started seeing in their brain... Like these neurons firing fast and they're like, "What's happening? Why is this happening? We thought that the brains just turned off." But no, people were very much sleeping but their brains started firing at a faster rate. And this is because the brain is actually slightly more active during this brain stage.

0:41:13.2 Dr. Lauren Whitehurst: During this sleep stage, one thing that's happening is that the neuronal firing conditions are starting to allow for an integration of learned memories to connect, right? So instead of having to learn discreet things over and over again it's important to be able to connect things over your lifespan. And so REM sleep seems to be really important for that, seems to be optimized. This kind of integration of learning seems to be optimized across REM sleep. Another thing that happens during REM is we have a lot of vivid dreaming, our prefrontal cortexes that are associated with kind of our rational brains, the part where we have rules and expectations for the world. That part of the brain is actually still quite silenced. But parts of our brain like our amygdala where we have a lot of our emotional experiences, it helps us process stressful information. That part of the brain is actually much more active contributing to that more firing that we see.

0:42:01.0 Dr. Lauren Whitehurst: And then our occipital lobes that we have in the back of our brain that are really important for processing visual information are also much more active. And so the kind of increased activity that we see are happening in our visual areas and in our amygdalas which allow for this processing of information that has these kind of like stressful emotional themes and are really visually intense. And so the dreams sometimes that people might have during REM sleep are these kind of more intense visual imagery emotional kind of experiences. And so that's why a lot of people think about REM sleep as a dreaming sleep stage. But I will say that you can actually dream in all stages of sleep not just REM. So now that you understand how these brain stages kind of transpire, it's important to think about how are they related to some of these cognitive outcomes that at least I care about.

0:42:49.0 Dr. Lauren Whitehurst: And so what we have found is that the ability to really consolidate learning to take the learning that you had during the day and work on that information and really connect the brain regions that are necessary to hold that information, that seems to be optimized during that slow wave sleep stage where the brain is really starting to synchronize. So that really slow state where those neurons can communicate at the same time and there's no new information from anywhere else coming in, right? And there's not all these synchronized neuronal firing happening in these random regions. And so that seems to be really good for the consolidation. Now what I've already discussed a little bit with REM sleep, is that REM sleep seems to be really good for the types of learning and cognitions that involve integration of new things. So REM sleep because you no longer have that prefrontal cortex on that's telling you what's expected, and what's rational and what should be, you have your occipital lobes on, some areas of your cortex and your amygdala on, you're able to make these new connections that you may not have made if that prefrontal cortex was telling you that's not aligned with the rules.

0:43:54.4 Dr. Lauren Whitehurst: So what people have found is that when people have really nice solid REM sleep, they often have better insight into problems that they didn't have solutions to before they went to sleep. And so REM sleep seems to be really good for things like that. So in some of the research that I've conducted, if we're interested in a certain cognitive outcome, we often try to manipulate the sleep that we're examining to best foster that cognitive outcome. So if we're really interested in consolidation, we want sleep that has a lot of that slow wave sleep in it. And it's not to say that REM sleep doesn't also contribute to consolidation. There's plenty of studies to suggest that it does. It just seems that without slow wave sleep consolidation is much more difficult. Same thing with the insight. Slow wave sleep can likely contribute to insight as well. There's no data to suggest that it has nothing to do with inside answer problems. But REM sleep seems to be optimized for that. So in our lab we use things like naps 'cause your sleep kind of changes across the day.

0:44:48.3 Dr. Lauren Whitehurst: So the type of sleep that you might get changes across the day. So we use nap methods where if we have a early morning nap that has a lot more rapid eye movement sleep in it, we'll be looking at outcomes that are associated with REM sleep. If we have a late evening nap that actually has a lot more slow wave sleep in it, just by some of the physiological pressures, we'll be looking at outcomes that have more consolidation or memories like aspects to it. So that's how we utilize the ways in which our biology exists to exploit that for our research purposes in the lab.

0:45:20.4 Ava Ma De Sousa: That's so interesting. How do you get people to nap? Is it easy to get people to fall asleep?

0:45:25.0 Dr. Lauren Whitehurst: People love falling asleep. Yeah, it's so easy. It's like never a problem.

0:45:29.7 Ava Ma De Sousa: Oh, okay.

0:45:30.0 Dr. Lauren Whitehurst: It's never a problem. I get that question, I get that question often with the research. 'Cause people are always like, "Come on. Like I can't... I never nap. I would never nap." And even participants come in and they're like... When we're hooking them up with the EG, we're attaching electrodes to them and they're like, "Oh my gosh, I'm not a napper." Like, "I'll never nap." And within 10 minutes of laying down they're out.

0:45:46.5 Ava Ma De Sousa: Really?

0:45:47.3 Dr. Lauren Whitehurst: Yeah.

0:45:48.9 Ava Ma De Sousa: Is it because people are sleep deprived or just because people love to sleep?

0:45:52.8 Dr. Lauren Whitehurst: Because our body will take the opportunity. It's rare for someone to lay down in a dark room with no other... With nothing else to do and not fall asleep. It's hard. It's a... We're putting them in the best conditions possible for them to engage sleep. A quiet dark room, nothing else is going on. And right before that you got a head massage because we were like applying electrodes to you with these like very gentle exfoliators. So most people just fall right asleep.

0:46:20.2 Ava Ma De Sousa: So interesting.

0:46:22.1 Dr. Lauren Whitehurst: Yeah, we even, we run studies with older adults who also... Their sleep is a little bit more fragmented when they take naps. It's not as... It's not as consolidated as our young... If we run younger or mid-life adults. But yeah even older adults have no problem taking a nap in the lab.

0:46:35.5 Ava Ma De Sousa: Oh that's so interesting. I would've assumed that was one of the biggest obstacles to doing this for... Okay. I don't wanna keep you too long but I really wanna get into your new work on sleep equity. So I was wondering if you could share some of that. I guess, is that what you would say if we can consolidate those two questions, is that what you would say is the new directions that you're working on?

0:46:55.4 Dr. Lauren Whitehurst: Yeah, I would say it's probably... I've not left any of the more basic questions about like sleep and cognition. Like we still have studies going on. Now that where we're asking those questions and how does... How do these basic autonomic nervous system mechanisms impact our ability to learn, think and remember? So impact the central nervous systems capacities. So we're still asking some of those questions, but yeah so I would say a newer direction that we have some ongoing studies I'm looking at now is really trying... If my career with the exception of the last two to three years has really been about establishing sleep as this really basic need not by myself. There's a lot of people who've done this as well, in thinking about it as this kind of integrated process with both the brain and the body contributing to the sleep state and them both contributing to our ability to think, learn and remember what and that being important to our health over the lifespan.

0:47:45.0 Dr. Lauren Whitehurst: And if I say that's been my career this far, then I have to start asking the questions about what happens if you don't sleep well? So what happens if you're not getting good sleep? How does the system break down? And so when I started to ask those questions, what I found was that those disparities in sleep or the individuals who don't get good sleep. One, I should start with saying a lot of people don't get good sleep, like one in three people in the US report insufficient sleep for their sleep needs. But when you start to look into that and break it down further you start to see that there's disparities in that that fall along very particular in clear lines. One of those is racial lines. So in America particularly we see that Black individuals sleep significantly more poorly than other individuals. If you wanna compare that to one of the most racially advantaged groups, White individuals, but they also sleep more poorly than other racial groups as well.

0:48:39.5 Dr. Lauren Whitehurst: And you could also find that along income lines, right? So individuals who come from poor backgrounds also sleep more poorly. Individuals who are experiencing food insecurities or other types of insecurities that are indicative of poverty, they sleep more poorly. And so when you start to look at that, you're like, "Okay, why?" Right? What is the kind of through line that we can link these things through? And so some of it is systemic and structural, some of it is a lack of education of the role of sleep in our lives. And so some of it needs to be more community based campaigning. And so we are doing a series of things in the lab trying to understand one, why these disparities exist? And two, what are ways to intervene to ensure that people not only understand how important sleep is but have the infrastructure around them to really support their sleep needs. In the lab right now we're really starting at that first question like how and why and where they... What these are? And so we really start with the historical nature of some of these sleep disparities.

0:49:37.7 Dr. Lauren Whitehurst: So the fact that Black individuals are some of the poor sleepers in America is not by accident. With anything, I would say it was probably by design considering the history of enslavement and forced labor practice and labor exploitation, that is going to create really adverse conditions for sleep. If you're labouring at times when your body would rather be sleeping which is what we consider today a shift work. So labouring at night and working at night when your body would much prefer to be sleeping. Black Americans are much more likely to take jobs where that's the type of jobs that they are doing, working longer hours. Black Americans often work jobs or they work longer hours. And so thinking about what are the conditions and why or where we're starting with that question. Me and some of my colleagues are writing more of a review paper on that right now. The links between kind of sleep and labor. And then we're also conducting some studies. So we're running a study right now where we're trying to understand daily impacts on sleep, daily environmental impacts on sleep for Black Americans.

0:50:33.7 Dr. Lauren Whitehurst: So we have individuals in the world wearing devices that help us track their sleep and understand their sleep. They're also giving us a lot of information about the environment that they're in. We're also learning a lot about their environment through just geo-coding their zip codes and their neighbourhoods. We're also learning a lot about daily stressors that can impact their sleep. So we're trying to model it from both individual, community and more societal levels that allow us to understand what are the barriers to good sleep for Black Americans? In these projects that I just ran through. But I'm also really interested in outside of some of these racial ideas. I'm also really interested in trying to move down the lines of all these other types of communities that are underserved, their sleep concerns are underserved. And a collaboration with some of my colleagues at the University of Iowa, University of Kansas. We're looking at rural communities and trying to understand sleep disparities particularly for those in those communities who have intellectual and developmental disabilities. Their sleep concerns are extremely underserved and those individuals have these cognitive impairments that are exacerbated by their sleep concerns.

0:51:37.1 Dr. Lauren Whitehurst: Yet these seem to be some of the most underserved groups in the community. So we're really focusing on rural individuals who have these cognitive needs yet their sleep needs are going underserved. And in another study with some of my colleagues here at the University of Kentucky, we've identified... Kentucky is actually one of the worst slept states in the union, in the nation. So it's a really poor sleeping state but there's also some counties in Kentucky that are really bad at sleeping even worse than others. And so we're actually looking at those really hotspot counties and trying to understand their sleep concerns and what's going on with their sleep and how their sleep is related to other health concerns, both cognitive as well as cardiovascular, infection risks, things like that. And then some of the environmental aspects that might also put them at risk for sleep loss. I will say that study right now is on hold because a couple of weeks ago we had terrible flooding in Kentucky and the counties that we were looking at were severely impacted by the flooding. So that study currently is on hold which again just gives you another like hint at how these environmental pressures can potentially impact sleep and how these longer term cascades on health with the idea that individuals have been displaced from their homes, from these environmental impacts of climate change.

0:52:45.7 Dr. Lauren Whitehurst: And climate change seems to disproportionately impact those who are the most vulnerable amongst us. And yeah, I feel like when we're talking about sleep we can go all the way up to the biggest questions and go all the way down to some of the most basic research questions which is why I love it.

0:53:00.9 Ava Ma De Sousa: So you said you're not doing this work yet but for the interventions, what kind of things do you think about? Because if you're looking at it from the structural perspective, it feels hard as a psychologist to intervene on those things without doing more direct kind of activism. So I'm just wondering what your approach with that is.

0:53:19.2 Dr. Lauren Whitehurst: Yeah, I think as researchers we can be multitudes, right? Like we don't have to limit ourselves to only one thing or the other. But I also really lean into collaboration. So I have collaborators who are in education, collaborators who are in legal professions, that really helped me think through how to move into different spaces and what that looks like. I have collaborators who are activists and collaborators who are community organizers, that really helped me think through, "Okay, what does this mean? And how do I work in communities in ways that could be impactful?" One thing that I can imagine just right through this conversation, and in a conversation with one of my colleagues we were talking about how important it is for people to recognize what a safe sleep environment looks like. And not many people know what I mean by that. If I say, "What is a safe sleep environment?" Everyone will be like, "I don't know, my bedroom?" Like they don't think about light intrusion or sound intrusion or they don't think about if you live in an apartment complex and you have like apartments on the first floor, turning your headlights off so that... Like flashing through people's bedroom windows.

0:54:12.8 Dr. Lauren Whitehurst: But we could do educational campaigns that really increase the knowledge in the communities about what that means. So flyering, posting ads, like there's all those little signs, thinking about like campaigning in a sense but like signs in people's communities about what's stroke risk? What does it look like if you're having a stroke? You can do the same thing about what does it look like if you're sleep deprived? Or what does it look like for a community to be sleeping well? Something that I've talked about working with communities here that live in low income housing there's a lot of surveillance of those communities, right? So there's cameras and the ideas that those cameras are there to keep them safe and protect them from whatever but those cameras have lights on them and those lights can flash, it can again, be pointed into bedrooms or they could be pointed at parking lots. And so the idea of not having these camera lights pointing into your bedroom instead of onto the parking lot is a very simple change that if community members were aware of it they might advocate for that. So giving people the right information so that they can choose what they advocate for and being a resource to provide the research knowledge is power. Right?

0:55:14.5 Dr. Lauren Whitehurst: So being a resource to provide that knowledge and support community partners and advocating for the changes that they want is really where I see my role as a researcher and moving that work forward. But I think the first thing is really getting out there and understanding where the barriers are and what the limitations are and then driving the educational campaigns based off of those things. And then having community members kind of partner in figuring out what they wanna advocate for.

[music]

0:55:41.9 Beth Fisher: So I thought of Lauren's, what she spoke about on sleep, equity was super interesting and I feel like with these things I've come across this a bit on the podcast is, you forget how all of these things that work together in terms of equity are intertwined. And when you hear about sleep equity it's like, "Oh, of course that makes sense." You've never really thought about it before. But yeah, of course something like this could have all these carry on effects. But I was thinking in terms of an Australian context 'cause yeah, her research obviously is based in America and she was talking about Black communities and also rural communities. And I am from the country, in Australia where I think I've mentioned that before. But yeah, a lot of farmers they have to wake up at 3:00 AM and these kind of things so they're not getting this right amount of sleep that they should. And as she also mentioned, because of climate change... Well even before climate change, they have a lot of stresses working on the land and there's floods, here we have bush fires. And I think we've always been able to make the connection between, oh these people in rural communities can have a mental health issues due to these situations they're put in terms of, bushfires and floods and the other things that comes from living in these places.

0:56:56.9 Beth Fisher: But I hadn't thought that the lack of sleep is contributing to that. And even when it's periods of there isn't a crisis. So I guess you think, "Oh, when there is a crisis someone's not sleeping and it makes it worse." But I hadn't thought, "Oh but when everything is going as it should, these people still have to wake up extremely early and then work late and that's contributing to that as well." And I think as she was saying in terms of sleep education, that would... Yeah, because we just don't think about that.

0:57:26.6 Ava Ma De Sousa: Yeah, I think that's exactly... The interesting part of it to me was the idea that we put sleep last. When we think about all of the different issues that maybe in rural communities people don't have access to healthcare in general. I don't know how it is in Australia but I know like rural communities in Canada because a lot of them are so remote and I think Australia's the same, 'cause these are big countries.

0:57:48.4 Beth Fisher: Pretty remote.

0:57:49.2 Ava Ma De Sousa: That it's just, yeah, it's very hard to get healthcare to those people for issues that we think are bigger. If someone were to... I don't know, break something or to have a heart attack or something that's recognized as "a bigger problem", but then sleep is like this ever present thing. And I think also, I had no idea about this link between that deep sleep where all of the areas in the brain sync up and the electric waves, the currents are synced up in the brain in this slow wave sleep and that also helps to clear out toxins and that's related to Alzheimer's disease. I had no idea about that.

0:58:26.2 Beth Fisher: That's super important.

0:58:27.8 Ava Ma De Sousa: Also the thing about how different naps, the timing of naps can lead to different sleep. It's like the timing of your sleep is probably also really important for you to get into the right phase of sleep, let alone not getting enough sleep. And so just because of that and those strong links it's like this is something that is extremely important to people every single day and not just on making sure that people have adequate healthcare in times of need but it seems like it's basically like the gym. Like it's something you have to do to maintain your health. And it seems like in a way so obvious because we all have to do it. But I think it's one of the things that a lot of the times we let slip and I also had no idea that one third of Americans don't get enough sleep. But I guess I'm not surprised by that and I wonder what the stats are in other places.

0:59:14.1 Beth Fisher: Yeah and it is interesting 'cause these jobs that usually pay more and have... I don't know, for more privileged communities they are these more 9:00 to 5:00 jobs, so then you can get the best hours of sleep. I don't know, you're 10:00 PM till 7:00 AM or whatever where as Lauren was saying you have the best time for memory consolidation and all of these kinds of things. So if you work shift work and you have to get up at 3:00 and maybe you're still getting these eight hours but it's the wrong time you're just not... You can't have those same processes going on. And it just seems like deeply like that's just crazy that you can't. And especially with memory consolidation and how important, that's so important and yeah. And then you think back to a lot about students who have to work in like... You just think there's so many things that come down to that and yeah, so we're both PhD students. I nap all the time. [chuckle]

1:00:08.2 Ava Ma De Sousa: What time of the day are you napping at then?

1:00:10.3 Beth Fisher: It is really interesting. It's 3:00, that's my best time. So I'll work, and I'll feel really, "Oh my God, this is just a lot of new information." And I'll have a sleep, feel great. But that...

1:00:22.4 Ava Ma De Sousa: Interesting. Okay so you're getting your slow wave sleep. So that's the sleep that's best for consolidation?

1:00:27.1 Beth Fisher: Yeah.

1:00:27.4 Ava Ma De Sousa: And when you're in the phase of trying to figure out your studies you should probably take morning naps then so you can have insight.

1:00:34.5 Beth Fisher: I love it. And I definitely... I also felt validated with my napping also from listening to Lauren.

1:00:40.2 Ava Ma De Sousa: I also have one more question for you about sleeping.

1:00:42.4 Beth Fisher: Yeah.

1:00:43.2 Ava Ma De Sousa: So one thing that Lauren talked about was how sleep is something that you do with people that you trust. That you have to be in a safe space for. And that got me thinking about cultural differences in sleep. Because one thing that I was really surprised about when I first went to Spain with my partner and spent time there with his family was that people are just out here taking naps all the time. Like if they're home no matter who's at home, as long as you're in the home I feel like you count as a family member and everyone's just asleep. Like everyone loves to take naps and everyone is like falling asleep everywhere. Like in front of... Even people you've only met that day. And to me that was really surprising because I feel like the rules around sleep and the norms around sleep are really different. And I definitely wasn't raised in like a space... Maybe it's because it was less collectivistic where people were just like falling asleep around each other. I feel like that's like an extremely intimate thing that you do behind closed doors. So I was just wondering like what your thoughts about that are? And whether you've had similar experiences or you feel like very strongly one way or the other about what sleep is like.

1:01:54.7 Beth Fisher: I feel like in Australia we're not taking group naps. [chuckle] That's not what we're doing at all. And yeah, it's not... I'm trying to think. We camp a lot. I don't know if then... Because that technically I suppose is sleeping with a group of different people but then you are in your own little zone. But that's the only thing I can think about when that is acceptable.

1:02:19.6 Ava Ma De Sousa: I think... But you're probably sleeping like at night, right?

1:02:22.8 Beth Fisher: Yeah. Not during the day. Yeah.

1:02:25.0 Ava Ma De Sousa: Yeah. It almost feels like it's I guess because of the way that the rhythm of society is because you have dinner so late. People usually have dinner around like 10:00 or 11:00 in Spain that there's not a lot of time to be... And they get up at the same time as everyone else people [1:02:40.2] \_\_\_\_ in North America, that they need to have a nap. So it's like part of the day's activities to sleep which I'd never thought about until talking to Lauren. But it was just interesting like this idea of like trust and sleep and also all of the rituals that we have around sleep which we didn't talk about as much but it does seem like there is also a lot culturally that goes into sleep because I think for both of us in Canada and Australia and I've never napped really around anyone in the US so far.

1:03:07.9 Beth Fisher: I also was thinking about that because I sleep really well when I go and stay at my mom's house. So if I'm having times where I can't... Not that I have a lot of difficult sleeping a lot but I don't know, if I just feel like I need that, I go there 'cause that's where I feel really safe and that safety allows me to sleep really well. And yeah, I thought that was interesting and I never made the... I just was like, "Oh, I'm feeling relaxed here. So that's why I couldn't sleep." I didn't make the connection about that feeling in that kind of safety, that safe place.

1:03:37.0 Ava Ma De Sousa: But I think one of the interesting things about what Lauren was talking about with sleep equity and education around this is like that you should also be prioritising those spaces where you feel safe so that you can get good sleep. Because if not you're really screwing with your body and your mind to not be able to adequately function or function as much as well as you could the next day. Or, maybe you should do stuff to feel safer at home, Beth.

1:04:01.8 Beth Fisher: Yeah maybe. I think I've mentioned about my interest in New York apartments on this podcast before but there was one stage where I moved into this warehouse that all the rooms were just like platforms. It sounds crazy maybe we can actually put a photo on the Instagram but it was as crazy as it sounds. And yeah, I paid 900 US a month for it and it was... I felt extremely unsafe because first of all, everyone could see me sleeping. That was one reason and it just didn't feel like a safe environment at all. And I really like... It was not a good time. And I was lucky enough that I was nannying for this really amazing family and then they were like, "Well, just come and move in with us." And I will never forget like the first night leaving that apartment and getting to the... Her name's Betsy, to getting to Betsy's, house and just feeling this really sense of safety and sleeping well the whole night through. And I don't think if I had that point of comparison where I could've left that I would've realized how much it was the sleep aspect of that house I was living in that was affecting me.

1:05:17.3 Beth Fisher: I don't think I ever would've made that connection. I thought, "Oh, I'm not sleeping because they're partying or something. Not about the safety aspect." And yeah, it was affecting me at uni and all these kind of things. And then I was so lucky to be able to remove myself from that situation and go somewhere extremely safe where I felt very cared for. And it was... Sounds full-on but it honestly it's like life changing. It's massive.

[music]

1:05:52.9 Ava Ma De Sousa: Thank you to Dr. Lauren Whitehurst for joining us this episode. Our intro and outro music is Nobody Stayed For the DJ by Glassio. Our transition music is Back For More also by Glassio. Minds Matter is mixed, edited and created by Beth Fisher. She's the Australian one and me, Ava Ma de Sousa. We'll be back in two weeks with a brand new episode of Minds Matter. In the meantime, find all our episodes and show notes on mindsmatterpodcast.com.

[music]