The Science & Process of Healing from Grief | Huberman Lab Podcast #74

This episode, I discuss grief and the challenges of processing losses of different kinds. I explain the biological mechanisms of grief, including how neural circuits for emotional and factual memory combine with those for love and attachment, to create feelings of absence and yearning. I discuss how grief is distinct from depression, yet why they can feel so similar. I also provide science-based tools to assist with the grieving process, including how to reframe and remap the relationship with those we have lost while still maintaining a strong emotional connection to them. I also explain the importance of having and building strong foundational psychological and biological states so that we can better cope with grief when it happens. Finally, I describe tools to adjust those states, including those for accessing sleep, managing stress and emotional swings. This episode is for those suffering from grief but also for everyone, given that we all experience grief at some point in our lives.

We recorded this episode before the recent mass shooting tragedies in the United States. While we hope the information in this episode will be of use to anyone suffering from grief of any kind and at any time, we are also careful to acknowledge that many people require additional support and resources. For that reason, we include mention of such resources and we generally hope people will access them if needed.

#HubermanLab #Grief

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- Welcome to the Huberman Lab Podcast, where we discuss science, and science-based tools for everyday life. I'm Andrew Huberman, and I'm a professor of neurobiology and ophthalmology at Stanford School of Medicine. Today, we are discussing grief. Grief is a natural emotion that most everybody experiences at some point in their life. However, grief is something that still mystifies most people. For instance, we often wonder why getting over the loss of somebody, or a pet, is so absolutely crushing. In some cases it's obvious, because we had a very close relationship to that person or animal, but in other cases, it's bewildering, because somehow, despite our best efforts, we are unable to reframe and shift our mind to the idea that the person or animal that at one point was here, and so very present, is now gone. Today we are going to discuss how we conceptualize grief, both at an emotional and at a logical level. I'm going to teach you about the neuroscience and the psychology of grief, and incredible findings that have been made in just a few key laboratories, that point to the fact that we essentially map our experience of people in three dimensions. I'll just give you a little hint of what those dimensions are. They relate to space, where people are, time, when people are, I'll explain what that means, and a dimension called closeness, and how those three dimensions of space, time, and closeness are what establish very close bonds with people, and are what require remapping, reorganization within our emotional framework and our logical framework, when we lose somebody, for whatever reason. Within that understanding, I'm confident that you will have greater insight into the grief process. And should you ever find yourself within the grief process, as I imagine most everyone will at some point, you will be able to navigate that process in what psychologists and neuroscientists deem to be the most healthy way of going through grief. Indeed, moving through grief requires a specific form of neuroplasticity, a reordering of brain connections, and also the connections between the brain and body. I'm going to teach you about all of that today, so you're going to learn a lot of scientific information. You will also learn a lot of tools that you can put in your kit of emotional and really, emotional physical tools, that will allow you to move through grief in this healthy way that I referred to earlier. I'll also point out some of the myths about grief. For instance, many of you have probably heard that there are designated stages of grief that everybody moves through. Turns out that recent research refutes that idea. There are different stages of grief, but not everybody experiences all of them, and hardly ever does somebody move through all of those linearly, meaning in the same order. I also want to point out that for many of you that are not experiencing grief in this moment, there's an

important scientific literature that teaches us that how we show up to grief, meaning our psychological and our biological state that we happen to be in when a loss occurs, strongly dictates whether or not we end up in what's called complicated or non-complicated grief. And non-complicated grief is a form of grief that is very prolonged, and in fact often requires that people get substantial professional help. So whether or not you're experiencing grief that's mild, moderate, or very intense right now, or whether or not you are not experiencing any grief at all,

00:03:44 Eight Sleep, InsideTracker, ROKA

you're going to learn scientific information and tools that will help you navigate through this process that we call grief. 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 Eight Sleep. Eight Sleep makes smart mattress covers that have cooling, heating, and sleep tracking capabilities. I recently started sleeping with an Eight Sleep mattress cover, and I am so glad that I did, because the sleep that I'm getting is superb compared to the sleep I was getting previously. I always thought that I slept pretty well, especially since I apply a number of different tools in order to sleep well, things like supplements, things like keeping the room cool, et cetera. But I have had a repeating problem over the years, which is that I would wake up in the middle of the night often, and sometimes have a bit of trouble or a lot of trouble getting back to sleep. I would have to apply other tools in order to get back to sleep. Eight Sleep allows me to adjust the temperature of my mattress and my sleeping environment, so that I fall asleep easily, and stay asleep throughout the night, which as many of you know is a game changer. Temperature is a powerful regulator of sleep and the ability to get into sleep. We know, for instance, that the body needs to drop by one to three degrees in order to get into sleep and to stay asleep. And with Eight Sleep, I can program the temperature of my bed so that it gets cooler as I fall asleep, gets even colder as I enter deep sleep, and at the transition to REM sleep, rapid eye movement sleep, it can get even cooler if I like. I actually like to maintain the same temperature through deep and REM sleep. And then it heats up slightly as I head towards morning, because of course heating up of the body is one way in which we wake up. So I have

this nice contour of cooling and heating that puts me through a beautiful arc of falling and staying asleep, and waking up when I want to. If you want to try Eight Sleep, you can go to eightsleep.com/huberman, and check out the Pod Pro Cover, and save more than $150 with an exclusive Memorial Day discount, now through June 6th, 2022. Eight Sleep currently ships within the USA, Canada and the UK. Again, that's eightsleep.com/huberman, to save over $150 with an exclusive Memorial Day discount, now through June 6th. Today's podcast is also brought to us by InsideTracker. InsideTracker is a personalized nutrition platform that analyzes data from your blood and DNA, to help you better understand your body and help you reach your health goals. I've long been a believer in getting regular blood work done, for the simple reason that many of the factors that impact your immediate and long-term health can only be assessed from a quality blood test. And nowadays with the advent of modern DNA tests, you can also get insight into, for instance, what your biological age is, and compare that to your chronological age. And of course your biological age is the number that truly matters. One issue with a lot of blood tests and DNA tests out there, however, is that you get values back about metabolic factors, hormones, and lipids, et cetera, but you don't know what to do with that information. InsideTracker solves that problem. They have a very easy-to-use personalized platform. It's a website where you can literally place your cursor over a given value, say for a hormone or metabolic factor or lipid, and it will tell you what you can do in terms of nutrition, behaviors, and supplementation in order to bring those values into the range that are optimal for you and your health. Find this immensely useful and very easy to use. If you'd like to try InsideTracker, you can go to insidetracker.com/huberman, to get 20% off any of InsideTracker's plans. Again, that's insidetracker.com/huberman, to get 20% off. Today's episode is also brought to us by ROKA. ROKA makes sunglasses and eyeglasses that are the absolute highest quality and have extreme versatility in terms of what they can be used for, and when you wear them. What do I mean by that? Well, the company was founded by two All-American swimmers from Stanford, and their goal was to develop eyeglasses for performance, things like running and biking and so forth. And you can certainly wear them for those activities. And I do wear them for those activities. I wear readers at night. I also wear sunglasses sometimes, when it's very bright out. One of the things that's terrific about ROKA sunglasses and eyeglasses, however, is that they're not just designed for sport. They have a terrific aesthetic, and you can also wear them out to dinner, to work, and so on. I say this because at least in my opinion, a lot of so-called sport eyeglasses or high-

performance eyeglasses and sunglasses make people look like cyborgs. ROKA, the aesthetic is really terrific. They're extremely lightweight and they don't slip off, even when you're sweaty. So you can indeed wear them on a hot day, or when running or cycling. They're not going to slip off your face. They're so lightweight, in fact, that I often forget that they're on my face. If you'd like to try ROKA sunglasses or eyeglasses, go to roka.com, that's roka.com, and enter the code Huberman to save 20% off on your first order.

00:08:35 Grief vs. Depression, Complicated Grief

Again, that's ROKA, roka.com, and enter the code Huberman at checkout. Okay, let's talk about grief. I just want to remind you that everybody, at some point in their life, experiences grief, either mild grief, moderate grief, or extreme grief, and it's somewhat obvious, but worth stating nonetheless, that how intense grief feels, and how long it lasts, scales with how close we were with somebody. And if you learn that the person who works at the coffee shop or that you see at the coffee shop on a regular basis, happened to pass away or tragically get killed in a car accident, that can be quite upsetting. It can be somewhat disorienting to you if you, for instance, just saw them yesterday or they seemed perfectly fine when you saw them last. But of course the grief that results from the loss of somebody to whom you have that level of attachment is far and away different than the level of grief that you would experience from the death of a very close loved one, a sibling, a parent, God forbid a child. When that type of loss occurs, it's often the case that our entire relationship to life feels different. Places and things that at once brought us joy and laughter now bring the opposite. They bring us intense feelings of sadness and loss. Psychologists and neuroscientists distinguish between complicated grief and non-complicated grief. They are very similar at the outset. One of the fundamental differences between them, however, is that complicated grief, which occurs in about one in 10 people, is a situation in which grief does not seem to resolve itself, even after a prolonged period of time. Later in the episode, I'll point you to the actual tests that are used. I've provided links to those in the show note captions, that will allow you to distinguish between complicated and non-complicated grief. These arrive through the important research of the world-class grief researchers that are out there and the psychologists that treat grief. The important thing to point out is that grief is a process. Like any biological or psychological event, it has a beginning, a middle and

an end. And I do believe that being able to orient in terms of where you are in that process can be immensely beneficial, not just for predicting how long it's going to last, but in order to conceptualize the person or animal that you lost, in a way that allows you to best preserve their memory while maintaining your own functional capacity in life. Along those lines, I want to point out that grief and depression, while they can feel quite similar in certain ways, and have overlapping symptomatology, loss of appetite, challenges sleeping, crying in the middle of the day for no apparent reason, et cetera, they are distinctly different processes. The modern research teaches us for instance, that grief rarely responds well to antidepressants, whereas depression can often respond well to antidepressants. Everything we know and understand about grief is that it is a distinct psychological and physiological event in the brain and body from depression. Rather, perhaps the best way to think about grief is that it is actually a motivational state. It is a yearning. It is a desire for something, and somewhat surprisingly, it's not just a desire to have that person back, or to have that animal back. You might think, "Well, that's crazy, of course it is." But of course, there are instances in which someone passing away or an animal passing away is actually providing relief for that person, because of where they happen to be in their life. Today, I'll teach you about grief as a motivational process, because grief as a motivational process really is the way that scientists and psychologists

00:12:20 Stages of Grief, Individual Variation for Grieving

now conceptualize grief, and the treatments for grief, so that people can move through them effectively. As we wade into this important topic, I'd like to emphasize some of the common myths and misunderstandings about grief. Some of the myths and misunderstanding arrive from the beautiful work of Elisabeth Kubler-Ross, a psychologist who wrote the famous book on death and dying. And I should emphasize that while Kubler-Ross was a real pioneer in establishing that there are indeed different stages of grief, the modern science, both psychology and neuroscience, point to the fact that not everybody experiences all of the stages that Kubler-Ross defined, nor do they move through those stages in a linear manner. Sometimes they're out of sequence. I'll just highlight the five stages that Kubler-Ross illustrated, because some people really do experience all of them, sometimes in the order I'll read them. But again, oftentimes they don't. The different stages of grief, very quickly, are denial, anger, bargaining,

depression, and acceptance. In the Kubler-Ross model, denial is always the first stage, and denial is just as it sounds, this disbelief, it cannot be, there's no way, a refusal to accept the new reality that the person or animal is gone. The second stage, anger, is one in which the individual recognizes that the person is indeed gone, or the animal is gone, but their body and their mind go into a motivated state. This is important. We're going to return to this idea of grief as a motivated state that involves action plans, in more depth as we go further. And then the third stage is bargaining, what's sometimes called the negotiating phase, this idea that, well, if I had just done this, or if they had just done that, or if I had called more, or somehow refusing to accept the reality. So in a way this can be blended with denial in thinking, "Well, if I just don't think about it, it won't be real," this kind of thing. So again, stages can be blended or braided together, because emotions are complex, right? Even though there are different stages to this process, they can sometimes be melded together. The fourth stage of depression that Kubler-Ross described is one of, why go on living? Why should I go on living? Why should I continue in this grief-stricken state that seems to deprive me of all the richness of life that I experienced when the person or animal was still here. And then the fifth stage is acceptance. This internalization, not just cognitively, not just thinking, but emotionally that it's going to be okay, that not just this too shall pass, but that it has passed. So again, the five stages of grief that Kubler-Ross defined were immensely important as a critical parsing of the different stages that one could move through. But unfortunately those five stages were sort of taken to be gospel for a long time. And we now know, based on neuroimaging, based on more in-depth psychological evaluation, and frankly, more researchers and clinicians moving into this area and observing that while much of what Kubler-Ross described does hold true, it's not always the case. And in fact, the contour of the grief process actually has a lot of dimensions that are not encapsulated by those five stages. There's also a lot of variation, depending on whether or not the loss is due to old age, disease, whether or not there was suffering prior or not, suicide or non-suicide type deaths and losses, and even grief about non-death losses, a relationship breakup, or something of that sort, or even homesickness and things of that sort. So I do want to tip our hats to the incredible work of Elisabeth Kubler-Ross. By no means am I or do other researchers try and discount her incredible contributions.

00:16:05 Grief: Lack & Motivation, Dopamine

But I think nowadays we have a different and frankly, a better understanding of what the grief process is like, and as a consequence, better tools to move through grief. In order to really understand what grief is in your brain and body, and how to best navigate grief, I'd like you to do an experiment with me. For the next five minutes or so, I'd like you to at least try to discard of all prior notions of grief as just a state of sadness. I want to acknowledge that it is and does involve sadness, but for right now, let's think about grief as a motivational state, as a desire for something specific. In fact, I'd like you to think about grief as an attempt to reach out and get something that you very much want. Imagine yourself extremely thirsty, for instance, on a very hot day, and a glass of water is right in front of you. And it's a beautiful, clean glass of water, and it's completely full, and you so badly want to drink that water. But no matter how intensely you want it, and no matter how hard you try and reach it, it always shifts just outside your reach. So if you can imagine that, even just a little bit, you are touching into the experience of grief. How do I know this? Well, I know this because brain imaging studies involving what's called functional magnetic resonance imaging, FMRI, in which you can evaluate which brain areas are more active than others, according to blood flow, which correlates with neural activity and so forth, teaches us that the brain areas that are associated with motivation and craving and pursuit are some of the primary brain areas and circuits that are activated in states of grief. I'd like to share an important paper with you, as one of the first to illustrate the fact that grief is not just a state of sadness and pain. It is indeed a state of yearning and desire of something that is just outside your reach, and unfortunately will always be just outside your reach until you remap your relationship to that person or thing. The title of this paper is posed first as a question, so that's why I'll read it as such. The title is "Craving Love? Enduring Grief Activates Brain's Reward Center." And the first author of this paper is Mary-Frances O'Connor. She's a professor of psychology at the University of Arizona, and one of the world leaders in the study of grief from a neuroscience perspective. With some luck, we'll get her here on the podcast as a guest. Now this paper has several important features. I'll just highlight a few. One of the features of this paper that's not surprising is they found that people who are in a state of grief are in a state of pain. That is, brain areas associated with pain, actual physical pain, are more active than in non-grieving individuals. However, they also found that people who are experiencing what's called complicated grief showed reward-related activity in a brain area called the nucleus accumbens. What is reward-related activity? Reward-related activity is activity of neurons that's associated with motivational states.

And the nucleus accumbens is a brain center in which dopamine has the effect of creating a motivated state. If ever you thought that dopamine was only associated with feeling good, you hear about dopamine hits, well, this paper and papers like it, firmly tell us that dopamine is not about feeling good. Dopamine is about placing us into a state of desiring things and seeking things. This is true in addiction. This is true when we're hungry and we want to eat. This is true when we want to reproduce. This is true in every state in which we are reaching for something outside our immediate ability to give that thing to ourselves. This is very important to understand, if you want to understand grief and how to move through grief. Grief is not just about sadness. It is a state of sadness, hence the activation of brain areas associated with pain, and it is a state of desire and reaching for something. And for those of you that have experienced grief, I think that will resonate with you. In that understanding that grief is both a state of pain, but also a state of wanting, and in the understanding that when we lose somebody, either because of breakup or because of death, or if an animal dies or gets taken away or is missing, that state of wanting and desire drives an activation state within us. Now, the key thing to understand is that the activation of those reward centers, and the involvement of dopamine puts us into an anticipatory state, a state of waiting for something to happen. It also puts us into a state of action or desiring action. Our body and our mind are what I like to refer to as center of mass forward. We are seeking how to resolve the craving, even if we know that is impossible. Why do I say that? Well, we understand, also on the basis of brain imaging studies, and also some studies in animals that I'll describe in a moment, that in order to understand grief, we have to understand how attachments are represented in our brain. And it turns out that both attachments and the breaking of attachments in healthy ways are governed by three important, what we call dimensions. A dimension is just some feature of the world that's represented in our brain. So for instance, the color red doesn't exist in your brain. You happen to have cells, neurons, in your eye that respond best to long wavelengths of light. And those long wavelengths of light happen to be what are reflected off things that are perceived as red. So in your mind, you have a notion of red. I know this is a little bit abstract, but you're not actually lighting up red neurons in your brain, and that's why you see red. You are lighting up neurons in your brain that represent the presence of red things in your environment. Similarly, we have neurons and maps, or we say representations of other dimensions. We have dimensions of touch. We have dimensions of sound. And as I'll now teach you, we have three dimensions that define our relationship to people and animals and things.

And when those people, animals and things are within our immediate vicinity, or if we know how we could access them, right? If somebody's still alive, there's generally some way to access them, unless they're refusing to interact with us. Well, when we understand that, our motivational states can operate in a way that's logical. We know that, for instance, if we want to find our mother, brother, sister, significant other, dog, cat, parrot, et cetera, we have to go through a certain set of steps.

00:23:15 Three Dimensions of Relationships

What are those three dimensions and how do they work? And that's what I'm going to teach you now. So at risk of sounding a little bit too reductionist, we are now going to describe your relationship to anything, everything, and anyone, in these three dimensions. How can we do that? Why would we even want to do that? Why would we want to rob the complexity of relationships of their contour and their detail? Well, if we can understand the dimensions in which we map our relationship to people, animals, and things, then we can understand why it is that when those people, animals, or things are not accessible to us, why it hurts so much, and why it takes a certain amount of time in order to re-understand, if you will, or remap our association to them. I promise that in grasping the information I'm about to give you, you will be able to better orient in the grief process, and you'll be able to move through it more effectively. The three dimensions of relating to someone, or an animal, or a thing, are space, time, and closeness. And in order to illustrate each one and how they work together to support relationships and their involvement in the grieving process, I'm going to tell you about an experiment. This experiment was actually done. The experiment involves putting people into a brain scanner that allows the researcher to evaluate brain activity in different areas. In fact, can look in a very non-biased way, not make any predictions about which brain areas are going to be involved. And the experiment is the following. The person, we should say the research subject, first sees images of things that reside at different distances from one another. And when I say things, these are objects. So in one case it's a beach or a parking lot with bowling balls set at different distances from one another. Their brain is imaged, and as their brain is imaged, they see different pictures of different scenes, the beach, the parking lot, et cetera, bowling balls spaced in different ways, close together, far apart, regularly spaced, non-regularly spaced. When one does this sort of experiment, you see a lot of brain areas activated. Not surprisingly, the visual cortex, the

area of the brain that is responsible for creating visual perceptions, but also a brain area that seems uniquely tuned to the distance between you and the objects. So whether or not the bowling balls are far away or close together from one another, and whether or not they are far away or close to you physically, so literally the distance between you and these objects. We'll refer to that measure, that dimension, as we call it, as proximity, okay? Whether or not it's very close to you, high degree of proximity, or far away, low proximity. But it's simply physical space. Then subjects listened to tones. Those tones also are spaced from one another. So it could be something as simple as my hand meeting the table top that I'm happen to be sitting in front of. So it's [hand hits]. They image the brain. Of course, areas of the brain that are associated with auditory perception are active, not surprisingly, but as they evaluate different types of sounds and patterns of sounds, for instance, [hand hits] they can start to parse brain areas that seem uniquely tuned to the spacing of sounds, independent of what sounds are coming in. So whether or not it's musical notes, or my hand hitting the table, or human speech, they identified a brain region that is uniquely tuned. That is, it becomes active specifically in response to changes in the spacing between sounds, much in the same way as they could identify brain regions that were only activated when there were changes in the distance between objects, such as the bowling balls that I used in the previous example. And then the subjects saw a different set of images. The images that they saw were of people, and of faces. And some of the images that they saw were of people's faces right up close, and other images were of people at a distance, where you could see the whole body of the person. Now, they also varied the emotional relationship to those people. That is, they were able to get photographs from these research subjects' lives, so they could show them pictures of, for instance, their sister or some random person off the street. They could show them pictures of a parent, or of a neighbor, or of a celebrity that's well known, or of somebody that they didn't know at all. So they were able to vary both the position of the person, close or far, and they were able to vary the emotional distance to the person, which is this dimension that I'm referring to as closeness, which is not physical closeness, but how attached, or how well you know somebody. Now, this is maybe sounding like a somewhat complicated experiment, but the takeaway from this experiment is exquisitely simple, and exquisitely important. The result was, that in all three conditions, changes in the physical spacing of these objects, changes in the temporal, that is, the time spacing of these sounds, and changes in the emotional distance between the subject and different people, the same brain area was uniquely

activated. Now that is an incredible thing to find, because what it suggests is that, yes, of course there are brain areas that are associated with representation of visual objects, and that yes, of course there are brain areas associated with representation of different sounds. And of course, there are brain areas associated with faces. We now know this. In fact, there's something called the fusiform face area, which is uniquely tuned to faces. But at the same time, there is a unique brain region that is activated in all three of the conditions I described, that has to do with how far you are from somebody, both in space, in time, and in terms of emotional closeness. And that brain area, it turns out, is a brain area called the inferior parietal lobule, the inferior parietal lobule. Now, you don't need to know where the inferior parietal lobule is.

00:29:52 Tool: Remapping Relationships

In fact, you don't even need to know the name of this brain area. What you do need to know, however, if you want to understand grief and how to move through grief, is that your map of people is not a map of emotional closeness per se. It is a map of emotional closeness, what we call attachment, that is interwoven, that is braided in, in a very intimate way, with your map of where they are in physical space, and where they are in time, when you saw them last, when you're likely to see them again, and if you were to want to see them, how much time it would take to reach them, or for them to reach you. Now earlier, I said that one of the key functions of our nervous system is to be able to make predictions. And so it's somewhat obvious, but nonetheless important to state and restate that one of the most powerful aspects of our attachments to people, animals, and things is our ability to predict what it would take to see them again, and when we are going to see them again. In fact, we could say that our ability to locate someone, or an animal, or a thing in space and time, right, where they are and how long it would take for us to reach them or them to reach us, is a prediction of the requirements to engage in the attachment. In order to illustrate this at a little bit more depth, let's just do a fill in the blank experiment. You can do this now in real time. I want you to think of somebody that you either rely on or that you care about very, very much. And I'll just allow you to fill in the blank on this sentence. "If I want to see blank," the person or animal, "I could see them within blank amount of time," right? If right now you wanted to see this person or animal, or maybe even a thing, how long would it take you to reach them? Could be a day, could be a second, could be they're right next to you. All you'd have to do is turn

your head. Now answer this. "If this person were to travel halfway around the world, and land in their plane, I would expect to hear from them within blank minutes of them landing." Okay, the answers of this of course, will differ. Now, I'd like you to answer this question. "If I'd like to find myself, it would take me X amount of time." And of course, if you're listening to this and you're understanding it and you're of a rational mind, the answer to that should be zero seconds, instantaneous. You are always able to locate yourself in space and time, provided you are in the appropriate state of mind, meaning not asleep, for instance. That last question might seem somewhat silly, but it's a fundamentally important one, because it illustrates the extremes at which we map our relationship to ourselves relative to other people and things. Now, if all of this sounds like a bunch of neuropsycho babble, parsing of the obvious, I'd encourage you to suspend that belief for the moment. Because if you understand that all relationships are mapped in the brain and body through these three dimensions, space, time, and closeness, or proximity of space, proximity in time, and proximity of attachment, how close or rich or bonded you are to someone, well, if you can understand that, then it almost becomes obvious, or at least it becomes intuitive, as to why, after the loss of somebody, in particular, a death, or the loss of an animal, this map has to be reordered. Why, because if we are attached to someone, or an animal, at a deep level, it is almost always on the basis of a lot of what we call episodic experience, a lot of episodic memories, memories of things that happen. Episodic memories are literally the conscious recollection of your experience of somebody, or an animal, or a thing. And within that memory, you have an understanding of what has happened with them in association to you, what's going on with them, where it happened, when it happened. You have a rich knowledge database that we call implicit knowledge, right? You might not be aware of it all the time, but it's within you, of what this person is like and what they're doing in their life. When somebody is taken away from us, for whatever reason, episodic memories persist for some period of time, and they are still linked to our feelings of attachment. Grief is the process of uncoupling, unbraiding, and untangling that relationship between where people are in space, in time, and our attachment to them. What I mean by this is when somebody or an animal or a thing is taken from us, either by decision or by death, or by circumstance, well, in that case, our entire memory bank and our ability to predict where and when they will be, and therefore when we can feed our attachment to them again, that whole map is obliterated, except that the attachment itself has not been disrupted. Assuming that you are deeply attached to someone or an animal or a thing, that

attachment persists, and the grief process is one in which you have to reorder your understanding of them in space and in time. This is very, very hard to do, and for some people it's almost impossible to do, at least at the outset of grief. This, in a very neurosciencey way, explains this stage that Kubler-Ross described, which many, again, not all, but many people experience, which is one of denial. How could it be, why? Well, when we have a rich catalog of experiences with somebody or of them, right, ideas about them and what they do, how they spend their day, what they do and don't do, where they do it, et cetera, well, that memory bank is not just flushed out the moment that we learn that they're no longer with us. What happens is, the brain continues to make these predictions that they will be in a certain place or a certain time, right, that they'll be in a certain time zone or they'll walk in the door any moment. All of those predictions still hold. The neural activity continues. We call this reverberatory activity. That explains the yearning for, and the desire to interact, and yet it's just beyond our reach. Because once they're gone, our brain still functions in a way, these neural circuits still function in a way that put us into an action state of seeking them, looking for them in the same location, expecting them to contact us at whatever frequency that we were used to hearing from them, or that we could reach out to them and reliably get a response. It is immensely disorienting, in other words, to maintain a close attachment, and at the same time to not be able to make predictions about where that person, animal, or thing is in space and time. Now, if this seems somewhat abstract, I'm going to continue to flesh it out.

00:37:15 Grief, Maintaining Emotional Closeness & Remapping

And actually right now, I'd like to flesh it out with a real-world example of grief and loss that comes to us from perhaps one of the greatest minds in human history, and somebody who was intensely grounded in reality and logic, and indeed the physics of the world. And the person I'm referring to is none other than the Nobel Prize-winning physicist, Richard Feynman. Many of you are probably familiar with Richard Feynman. Some of you perhaps are not. Richard Feynman was a Nobel Prize-winning physicist, known for his thick New York accent. He was actually not from Brooklyn, as many people think. He was actually from Far Rockaway in Long Island. Thick New York accent, very personable, exceptional teacher, brilliant mind, hence the Nobel Prize in physics. Also a quite funny and amusing person, told great anecdotes, et cetera.

Feynman had a childhood sweetheart who turned out to be his first wife. Her name was Arline, and it was well known that Feynman was absolutely in love with her. He would talk about her all the time. She had a profound influence on him and his thinking, and ultimately on his public education efforts later. If you haven't already read books such as "Surely You're Joking, Mr. Feynman," or "What Do You Care What Other People Think," I encourage you to do so. And in fact, that quote, "What do you care what other people think," is actually a quote, not of Feynman, but of his first wife, Arline, who sadly, died at a very young age from tuberculosis. Why am I sharing Feynman's story of loss of his first bride? Well, the reason is, Feynman continued to write letters to Arline for a long period of time. This is well known only because after Feynman died, it was discovered that he kept an archive of letters to his deceased first wife. And even though he did eventually marry, and in fact had many relationships with many people, and I think was married twice more, maybe it was once, maybe it was twice, the intensity of his grief, but also his lack of ability to transition his mind to a place where he understood that Arline had died, is one of the more profound examples of this inability to reconcile the logical world and the emotional world. And I'm now going to read to you a letter that Feynman wrote to Arline. This was discovered after Feynman's death, when they went through his desk and his belongings. And as I read this, you're going to hear some of the typical narrative of grief that is not unique to Feynman and his dead wife, but there are also some elements in there that I think you'll recognize as highlighting this disbelief and this dissociation between the reality of somebody's location in space and time, and the emotional attachment that they hold for us. And therein lies the information about how to better navigate grief. So now I'm reading from the letter. This was a letter dated October 17th, 1946. It's not terribly long, but bear with me. "Dear Arline, I adore you, sweetheart. I know how much you like to hear that, but I don't only write it because you like it. I write it because it makes me warm all over inside to write it to you. It is such a terribly long time since I last wrote to you, almost two years, but I know you'll excuse me, because you understand how I am, stubborn and realistic, and I thought there was no sense to writing. But now I know, my darling wife, that it is the right thing to do, what I have delayed in doing, and that I have done so much in the past. I wanted to tell you I love you. I want to love you. I will always love you." So here we can hear the intense emotional attachment that clearly has persisted. "I find it hard to understand in my mind what it means to love you after you are dead, but I still want to comfort and take care of you. And I want you to love me and care for me. I want to have problems to discuss with

you. I want to do little projects with you. I never thought until just now that we can do that. What should we do? We started to learn to make clothes together, or learn Chinese, or getting a movie projector. Can't I do something now? No, I am alone without you, and you were the idea woman and the general instigator of all our wild adventures. When you were sick, you worried because you could not give me something that you wanted, and you thought I needed. You needn't have worried. Just as I told you then, there was no real need, because I loved you in so many ways so much. And now it is clearly even more true. You can give me nothing now, yet I love you so that you stand in the way of my loving anything else. But I wanted you to stand there. You, dead, are so much better than anyone else alive." So you can really appreciate the depth and intensity of the attachment. Despite two years' time, it clearly has not waned. I'll read the final paragraph now. "I know you'll assure me that I am foolish, and that you want me to have full happiness, and don't want to be in my way. I bet you are surprised that I don't even have a girlfriend, except you sweetheart, after two years, but you can't help it, darling, nor can I. I don't understand it, for I've met many girls, and very nice ones, and I don't want to remain alone. But in two or three meetings, they all seem ashes. You only are left to me. You are real. My darling wife, I do adore you. I love my wife. My wife is dead. Rich. P.S., please excuse my not mailing this, but I don't know your new address." So there's a lot contained in this letter. We could parse it line by line, but I think it's fair to say that clearly, there's an immense attachment that's been maintained. So that's that dimension of closeness of attachment. Clearly, there's an understanding that she's dead. In fact, the last line of this love letter is, "My wife is dead," right? He now moves her into the third person, in fact, in that final line. So he understands this, and yet he maintains the attachment. And the very last portion of the letter, the P.S., the postscript, "I don't know your new address," right? Somewhat humorous in the typical vein of a Feynman writing or speech. He always had a intensely amusing and playful sense of humor. And yet there's something really contained in this. I don't think we're reading into this too much, in that he doesn't know where to find her. He feels her as very real, and yet he doesn't know where to find her. He doesn't know her address. He obviously knows she's dead, so there's nowhere to mail it to. The reason I shared this letter with you, as opposed to one of the almost infinite number of other letters that have been written by poets and authors and scientists and everyday people, is that it really encapsulates all three dimensions of attachment and grief. These notions of space, where is something or somebody, time, this dimension of, how long would it take me to reach them or for

them to reach me? What would it take, in terms of time, to be reunited? And then that last dimension of closeness, and the letter beautifully illustrates the fact that, in grief, we maintain that sense of closeness. And yet we have to uncouple it

00:44:40 Memories of Loved Ones & Remapping Attachments

from these other two dimensions, as we're referring to, space and time. So with this current understanding in mind, a few things start to become obvious and entirely normal to us, in the best and most healthy sense of the word normal. For instance, if you've lost somebody, or an animal, or even a thing that was vitally important to you, it should make perfect sense to you as to why you keep looking for that person. I recall this in my own life. I had the unfortunate circumstance of my graduate advisor, who I was very close with, died quite young of breast cancer. And her daughter, she actually has two daughters, kept her cellphone and would occasionally call me. I had a quite close relationship to their family. And when it would come in, the number would pop up on my phone of not the daughter, but the name that showed up was of my graduate advisor. So for years after she died, my initial impulse, when the phone would ring was, "Oh my goodness, she's calling." It was a reflexive excitement because I truly always enjoyed hearing from her. She was a wonderful, incredibly wonderful person, I should say. Similarly, when somebody passes away, we will find ourselves looking into a room expecting to see them there, or expecting them to knock on the door any moment, or to call on Sunday morning, as it were. Those expectations, those predictions that the brain is making, are entirely normal, because they are based on that deep catalog of episodic memory that you maintain about that person. Again, the depth and richness of that catalog scaling, of course, in direct relation to how close you were with that person, right? Closer to somebody means more information about them. More information about them means your brain has a lot of implicit, unconscious notions of when and where and how they show up. So the fact that your brain, and indeed, sometimes your body reacts to the expectation that they'll be there is entirely normal. It's simply an activation of this map that involves closeness, space, and time. Not surprisingly, then, the reordering of that map that's required in order to move through the grieving process, is going to involve some remapping. And you, as the person grieving, have the opportunity to ask which node as it's called, which element or dimension within that map, are you going to focus on? Some people really try hard to disengage with and remap their sense of

emotional closeness to the person. That is, it's so unbelievably overwhelming to them, that the person is no longer accessible, that they try and change their ideas about how close they really were. They try and change their emotional attachment to the person after they've died. Clearly in the example that I gave in the Feynman letter, that's not the case. The attachment seems indeed quite fixed and not going anywhere. Psychologists and neuroscientists generally agree that the best way to approach moving through grief is actually to remap these dimensions while maintaining the close sense of attachment to the person, by not in any way trying to undermine

00:48:04 Yearning for Loved Ones: Memories vs. Reality, Episodic Memory

the intensity of the attachment or how important it was to you. So we'll now talk about how that process works, and the different entry points, as they're called, to engaging in that process. So one straightforward way to think about this state of mind and body that we call grief, is that the idea that someone, or an animal, or a thing, simply does not exist anymore is not something that the brain can easily conceptualize. And the reason for that is that we, as beings that have a brain, and a brain, as an organ that makes predictions, tends to rely more on experience than knowledge. In other words, the knowledge that someone, or an animal or a thing, is gone, that it doesn't exist, at least not in the dimensionality that we were accustomed to relating to them in, is something that we can understand logically, but that emotionally is very hard to undo, and from a memory perspective is very hard to undo. So it's not just that we are in a state of emotional disbelief. It's that we have neurons, literally nerve cells and neural circuits, connections between nerve cells, that are dedicated to this vast, implicit knowledge of all the things we know about that person, animal, or thing. And just because they are no longer in the dimensionality, meaning in the configuration, alive or present in our life that they were before, doesn't eliminate those memories. Those memories persist. And so anytime we call to mind the person's name, or we call to mind things that remind us of them, or we suddenly feel the desire to engage with them, the memories, those episodic implicit memories, as they're called, all that menu and library of knowledge, slams us straight in the face, and pushes us into a mode of wanting to act in a way that's consistent with them still being here in the way that all that knowledge told us they were when we acquired it. That's a very long-winded way of saying that there's nothing wrong about the emotional state when we are in a state of grief, in fact, quite the opposite. But

there is something wrong about the memories, because the memories are based on our prior knowledge of them, and those memories actually do not apply to our current knowledge of them. And again, even though our brain is a prediction machine and it's a very good one, it's not perfect. In fact, it's far from perfect. So really, moving through grief is a process of understanding how relationships are mapped in the brain, space, time, and closeness, also called attachment, understanding those three dimensions, understanding that they are closely linked, and then understanding that simply the knowledge that somebody or something or an animal isn't accessible to us, does not allow us to discard of all the knowledge that we have. And as a consequence, our brain is constantly generating expectations of how to access them, even if we know that's completely irrational. Now this should, I would hope, assist you in moving through grief. It's not a tool of the sort of, like a switch that you can flip and suddenly not feel grief, but it does point to a specific set of mechanisms or a specific set of steps that you can engage in order to start to move through the grieving process in the most adaptive and effective way,

00:51:40 Tools: Adaptively Processing Grief, Counterfactual Thinking, Phantom Limbs

and in a way that still holds in mind, your close attachment to the person. So let's talk about some of the tools for adaptively moving through grief. These are tools gleaned from the research psychology, the clinical psychology, and the neuroscience literature. So I've synthesized my understanding of those three literatures, to provide the tools that I'm about to describe. The first one involves the acknowledgement and really the understanding that you don't want to disengage or dismantle your real attachment to someone, an animal, or a thing. That's a real thing, and there is actually no adaptive reason to try and persuade yourself or numb yourself, or somehow avoid the thinking of just how much they meant to you. What is important, however, is that you make some effort to shift your mindset and your understanding of that person, in a way that holds in mind that yes, indeed, the attachment is very real, and in some cases is very, very intense, but is now going to be uncoupled from the other two dimensions of the map, namely space and time. So again, just to make absolutely clear, there's no reason to try and convince yourself that you weren't actually that close to this person or them to you. There's no reason to try and reduce the intensity of that attachment. To the contrary, you want to anchor yourself to that attachment, but you want to make sure that your thoughts

about the person, and your feelings about the person, are not oriented toward or in reference to, I should say, that map, that deep catalog of memories that you had. Now, this is not simply a fancy way of saying, don't live in the past. This is saying, you need to maintain your sense of attachment, but you need to start making predictions and understanding about how you're going to engage with that attachment, how you're going to feel those things, without the expectation that things that once happened before are going to happen again. So it's a complicated process, you can imagine, but you really want to hold and register two things at once. It's sort of like spinning two plates at once, and therefore it's going to feel like effort. One way to do this is to set aside a dedicated period of time, of maybe five or 10, maybe even as much as 30 minutes, or depending on your capacity, 30 to 45 minutes, in which you are going to feel deeply into your closeness and your attachment to that person, animal, or thing. But you are consciously going to try and prevent yourself from thinking about a couple of categories of things. First of all, you want to actively try and disengage from any attempt to engage in what's called counterfactual thinking, the what ifs. What if I had called them a day earlier? What if they had taken a different route home? What if I had taken a different route home? These counterfactual modes of thinking are an infinite landscape of possibility, and they are very closely tied to guilt. Guilt is an interesting emotion. We should probably do an entire episode about guilt, but guilt as defined by psychologists and neuroscientists is actually a way of assigning ourselves more agency, more capability of controlling reality than actually exists. And it's a very slippery slope. And I want to be clear. It's not the case that guilt is never an appropriate response, but in the context of grieving, guilt is very precarious, because in thinking "I could have done this," or "if I had only done that," you are essentially exploring an infinite landscape of things that you can never refute. You will never know that had you not gone down a different path or they had not taken a particular path in life, that things would've turned out different, but you can't know that it would've worked as well, meaning you actually don't know that your what ifs are true, and you don't know that they're not true. And so as an infinite space, it's a very precarious one, and it will not allow you to uncouple that intense emotional attachment that I'm telling you is actually vital to hold onto, from that catalog of episodic memory that you've established. In fact, it's going to strengthen those bonds. So in this dedicated five or 10 or 30, whatever period of time you can tolerate and maintain focus, the idea is to think about your attachment in a rich way, and to perhaps even experience that in your brain and body. I think if you're in a stage of grief, that actually will be fairly reflexive to

do, but to try as much as possible to hold that grief in the present and to be connected to your immediate physical environment. So you want to orient yourself in current space and time, rather than focus on memories, or what you would've liked to see happen, or the wish that they were still there, while at the same time, thinking about the depth and richness of that attachment. This is a obviously a tightrope walk, so to speak. It's an emotionally challenging, and sometimes even will be experienced as a physically challenging tool or experience, but in our understanding of how attachments and grief are represented in the brain, this can be an immensely beneficial practice, because it is the first step, and indeed, it represents many of the steps in the voyage from the initial shock of loss, to our ability to hold in mind somebody or an animal or a thing in a way that still allows us to feel the depth and fullness of connection to them, without feeling the yearning, that reaching for the glass of water that unfortunately will never be resolved. Keep in mind that as you embark on this process, it is entirely normal for your mind to flip into various states of expectation that they're suddenly going to be there. In fact, because of the closeness of these three dimensions in the map, space, time, and attachment, it's entirely normal that when you start to think about your attachment to somebody, or an animal, or a thing, that you almost start to experience them as present in that environment. I'll share with you a somewhat bizarre, or it sounds bizarre to articulate out loud, but many of you perhaps will resonate with this. For years after my graduate advisor died, I would get an experience of someone touching the back of my neck when I would think about her. And that was not an experience I ever had with her, right? It was a professional relationship. I don't ever recall her touching me on the back of my neck, or me touching the back of my neck in her presence, at least not on any regular basis. So it was very perplexing to me. And then I encountered this incredible literature on grief, which said the following. "Grief in many ways is like a phantom limb." For those of you that aren't familiar, many people who experience amputation of a limb, either through surgery or accident or otherwise, will feel in a very genuine way that the limb is still present, even though when they look for the limb, it's not there. So they can feel pain in limbs. They can feel the sensation of touch. There's some famous experiments from the neurologists and my former colleague at University of California, San Diego, who goes by his last name, Ramachandran. Some people just call him Rama. He's an incredible scientist, and has done a lot of really important work, in particular on phantom limb, among other things, and has done some beautiful experiments showing that people who have phantom limb pain or that are experiencing

different sensations in their phantom limb, that can be very intrusive, much in the same way that expecting someone to walk through the door, who you happen to know is deceased, can be very intrusive. Ramachandran's done beautiful experiments, showing that if you give people what's called a mirror box, this is a box in which you insert an intact limb, and there are some mirrors that give you the visual impression that the other limb is still present, and you move the intact limb and you get a mirror image of the non-existent, but nonetheless a visual image of the phantom limb moving, that you can resolve some of the pain of a limb that feels otherwise cramped up. In other words, the visual perception can reverse some of these phantom sensations. In many ways, the phantom limb scenario, and what I described about a sensation of being touched on the back of the neck, or this feeling that we have when we engage in the thinking and the emotions of our attachment to someone, an animal, or a thing is very much like a phantom limb, only it exists in the emotional space, and it exists because it is reactivation of these maps about space, time, and person. And so if the process of moving through grief, adaptively in a healthy way, involves maintaining the attachment, but uncoupling that attachment from the space and time representation of that person,

01:00:32 Tool: Remembering Emotional Connection & Processing Grief

animal, or thing that we had before, well, then the question becomes, where should we place our expectation of them, right? Now, that of course will vary from person to person. Some people with particular religious beliefs will indeed believe that the soul of the person, the molecules of the person have been reordered and exist in some sort of either distributed domain, right? That they are in everything, or they are in one location. I'm not here to speak to that one way or the other. There's no good experiment I know either to prove or disprove that, nor would I want to. It's not the job of science, frankly. However, allowing ourselves to place notions of where that person, animal, or thing is in their current new configuration, whatever that might be, ashes to ashes, dust to dust, or that the person's soul comes out of their body. These are all the different variations that people hear. Or some people think, "Well, it's just molecules and they disintegrate and are reordered, and come up as the plants and the trees." Again, a near infinite number of possibilities, and it depends a lot on personal belief. It is, however, essential that no matter what you believe, that you have some firm representation of where that person, animal, or thing is so that you can plug it into this map, this three-dimensional map of

space, time, and attachment. The process of moving through grief can't simply be that we hold onto the attachment and we discard with any understanding of where they are in space and time. And actually, the letter that Feynman wrote to his deceased wife Arline, again, so beautifully and really poignantly illustrates the fact that he doesn't really know where to find her. On the one hand, he really understands that she's gone. And on the other hand, he understands that he still very much expects her to be there, that he would like to mail the letter. But then of course, in this final, somewhat humorous line, he doesn't know where to send the letter, he tells us. What's very clear, and I think is very healthy, is the fact that the emotional bond is still there, that that is maintained. And so this tool, if you will, of dedicated blocks of time for really spending some effort, and it is indeed effort to access the emotional connection while starting to uncouple the other nodes of the map, as it were, is something that is hard. You should expect it to be hard, but in terms of the options one has in order to deal with grief, it is indeed the most adaptive way to go about it. You're not trying to avoid thinking about it. You're not engaging in this counterfactual thinking, the what if, what if, what if. You're not drowning it out with substances or delusion or with other ways of distracting yourself. So in that sense, it is truly adaptive. Now, of course, I don't want to imply that I'm a clinical psychologist. I'm certainly not. There is absolutely a place for working with a trained professional to move through grief, especially these situations, these one in 10 people who deal with what's called complicated grief, or very prolonged grief. Those are somewhat different things, but in general, point to the fact that there are people who have an exceptionally hard time moving through grief. We'll talk about who those people are and ways to move through them, with or without a professional to assist you. But nonetheless, we're starting to understand on the basis of neuroscience,

01:04:03 Memories, Hippocampal Trace Cells & Feeling An Absence

what some of the more adaptive and functional ways of moving through grief are. In order to really understand how a tool of the sort that we're describing to work, and what it's designed to accomplish at a mechanistic level, I'd like to teach you about a very important aspect of your brain function that has everything to do with grief and the process of moving through grief, but has a lot to do with other aspects of our life experience as well. Some of you are probably familiar with a brain area called the hippocampus. The hippocampus is a structure that's involved in the formation of new

memories, but not the maintenance of memories. I discussed the hippocampus in detail in our episode on memory, and our episode with our guest, Dr. Wendy Suzuki from New York University, an expert on learning and memory. During those two discussions, I did not however, touch into what the different cell types are in the hippocampus, and the different roles they perform. And it turns out that there are indeed different cell types in the hippocampus, and they perform very different roles that are absolutely central to the grief process. We have cells in our hippocampus, meaning you have cells in your hippocampus. These cells are neurons, nerve cells that fire any time, or, and when we say fire, I should just remind you, I mean, have electrical activity, any time that we enter a particular familiar location. So for instance, think about your bedroom, and think about where the bed is. As you're doing that, these so-called place cells are firing, not necessarily to represent that it's a bed at that location, but to represent the location itself. We also have neurons in our hippocampus and elsewhere in our brain, I should say, that represent proximity. So for instance, if you were to wake up in the middle of the night and walk into the kitchen, and it's somewhat dark, and you orient toward the sink to get yourself a glass of water, or to the refrigerator to get yourself something to drink or to eat, as you get close to the sink or the refrigerator, there are neurons in your hippocampus that are going to start engaging electrical activity, because you are in the mirror expected proximity of the sink or refrigerator, and you know where they are, hence the word expected. Now that all seems fine and good. You've got neurons that represent where things are, and it sort of goes without saying that those same neurons map to our emotional attachments. We generally know where to find our loved ones. Even if they don't live with us, we generally know what city they're in. Even if they're traveling, we generally have a sense of where they're traveling or the general area in which they're traveling. Place cells and proximity cells are involved in that kind of mapping and representations as well. Now there's a third kind of cell that's particularly important for the sort of tool that we were talking about earlier, that tool of holding on to the emotional attachment to somebody, and yet trying to deliberately remap our understanding of where they are in space and time. And that has to do with a category of cells called trace cells. Trace cells were discovered by a number of laboratories. I think the most renowned of those is the Moser Laboratory. The Mosers are a couple. Actually, they were a couple. They're now, I think, amicably separated or divorced. That's not what this episode's about. If I have that wrong, forgive me. Edvard and Britt are their names. Their relationship isn't what's important, except what is important is the work that

they did together in one form or another, which was very important work, establishing this category of cells not just in the hippocampus, but in an area of the brain called the entorhinal cortex, that acts as a sort of coordinate system, to orient us in space and time. Trace cells are activated when we expect something to be at a given location, but it's not there. Experiments done in their laboratory and in other laboratories have shown that, for instance, if you give a rodent or frankly, a person, a object that always resides at the same location, and we reach to it in order to access it, let's say where your coffeemaker is in the morning. I do a pour-over coffee. If I'm drinking coffee or latte, I'll do a pour-over. It's always more or less in the same location. And so there are place cells and proximity cells that relate to my being able to find that pour-over coffee cone thing. However, if I were to go to that location and it wasn't there, the trace cells, these neurons in my hippocampus and in the entorhinal cortex and elsewhere, 'cause again, these cells are connected by way of circuitry, by way of connections, those trace cells would fire. We could even call it a trace circuit. It's a circuit that has an expectation that something will be in a location. But when something is not at that location, this circuit becomes active. This is important because what we're talking about here is a neural circuit and a set of neurons that are responsible, not for the presence of something, but the absence of something. We have every reason to believe, based on neuroimaging studies and studies in animal models, that trace cells become very active in the immediate stage after the loss of a loved one, that the brain and our maps of the person, place, or thing that we know cognitively, we understand, we even believe they are gone. They are not accessible for whatever reason, death or otherwise. And yet we have neurons that are firing, to reveal that absence to us. And these neurons are closely associated with neurons that tell us where things ought to be. So if you feel the expectation, or you sense that somebody should walk through the door any moment, or call at any moment, or be next to you when you wake up, and yet you cognitively understand that they won't, that there's no real reason why they should, because they are indeed gone, you are not crazy. In fact, it's simply a reflection

01:10:14 Yearning & Oxytocin, Individualized Grief Cycles

of the normal functioning of these trace cells and trace circuits. Now I'd like to consider why two people, both who are intensely attached to a person that is no longer there, can experience the grief of the loss of that person in such different ways. This is often

observed. You can have, God forbid, incredibly sadly, in cases where a child is lost, where both parents are grieving intensely, but one seems to feel it at a emotional depth and level that seems distinct from the other. Now of course, keep in mind that we never really know how other people are feeling. This is something actually that was raised in the episode where I interviewed a psychiatrist and researcher colleague of mine from Stanford, Karl Deisseroth. As a psychiatrist, I heard him say once that we really don't know how other people feel. In fact, a lot of times we don't even really know how we feel, or at least describing that is quite challenging with language, often. And indeed that is the case. We don't really know how other people feel. There's no clear way of knowing that the expression someone else has or whether or not they're crying or not, or their body language really represents how they feel inside. So that is important to keep in mind. Nonetheless, there does seem to be a sort of a split among people, and indeed, among animals as well, even within a species, in terms of how intensely they feel the yearning aspect of grief. And it appears, based on a number of different lines of evidence, that that relates to this molecule that some of you have probably heard of, which is oxytocin. Oxytocin is a hormone slash peptide. A peptide just means a protein, generally a small protein, and a hormone is generally something that functions at numerous locations in the body to impact numerous organs and areas of the brain. So a peptide can be a hormone, and a hormone can be a peptide. They are not mutually exclusive. Oxytocin has a variety of roles in the brain and body. It's involved in milk letdown during lactation. It's involved in pair bonding, both in males and females. It's involved in bonding of parent to child, and indeed, between romantic partners, et cetera, et cetera. Let's talk about some of the animal models that inform us about the potential roles of oxytocin in the grieving process. There's a species of animal called the prairie vole, and believe it or not, the prairie vole has been studied fairly extensively by neuroscience and psychology researchers. In fact, our former director of the National Institutes of Mental Health, Tom Insel, his laboratory focused quite heavily on prairie voles. Prairie voles are one species of animal, but depending on where they live, you find that some prairie voles are monogamous. That is, they mate with the same prairie vole for life. They raise litters of little prairie voles for life, and other prairie voles, generally that live in different locations in the wild, are non-monogamous, sometimes called polygamous. The neurochemical and circuit basis for this monogamy versus non-monogamy, quite interesting. However, in the context of grief and attachment, the prairie voles have taught us a lot, and they've taught us a lot through the following experiment.

You take two prairie voles that are coupled up. So these would be monogamous prairie voles, that have established a couple bond. I guess you would call that at a prairie voledom. Anyway, you put them in a cage together. They mate together, they raise young together, and then you separate them. You literally put a physical barrier between the two of them, and you can evaluate how strongly one prairie vole will work to get access to the other prairie vole, right? This is sort of the "Romeo and Juliet" of prairie vole experiments. And what you observe is that the monogamous prairie voles will work very hard to get back to their mate, to get access to their mate. They will lever press. They'll even walk across a metal plate that they get a electrical shock. They'll work very, very hard. They will cross rivers and valleys, if you will, in the experimental context, that is. The polygamous prairie voles, and again, we don't know if they are polyamorous. We don't know what they feel, right? We don't know if they're in love or if they're motivated simply for other things. But the non-monogamous prairie voles will not work as hard to access a prairie vole partner. Now you could argue that's because they expect that there will be other prairie vole partners, but even if they've never experienced another prairie vole partner, they won't work quite as hard to get back in connection with this other prairie vole, to mate or otherwise. This turns out to be interesting, when you start to explore the patterns of so-called oxytocin receptors in the brain. To make a long story short, and to also bridge to the human literature, it turns out that the monogamous prairie voles have far more oxytocin receptors in this brain area that I mentioned earlier, the nucleus accumbens. And again, to remind you, the nucleus accumbens is the brain area associated with motivation, craving and pursuit. So it's as if the monogamous prairie voles have a capacity to link the attachment circuitry and the molecules of attachment, in this case, oxytocin, to reward pathways and to motivational pathways. Polygamous, or we should say, non-monogamous prairie voles, do as well. However, they have less oxytocin receptors. So in other words, non-monogamous prairie voles seem to have less yearning for attachment overall, at least to a single individual prairie vole. And when we look at the human literature, in terms of oxytocin receptor expression and brain imaging experiments, and so on, what you find is the same, that people that experience intense grief, and a deep yearning and a motivation to reconnect with the person, animal, or thing that is lost, in many cases have heightened levels of oxytocin specifically, or I should say, oxytocin receptors to be exact, specifically within the brain regions associated with craving and pursuit. So for those of you that find yourself in this kind of stuck mode, this persistence of trying to reach into the past or wishful thinking, this

counterfactual thinking, "if only, if only, if only." You don't necessarily want to pathologize that thinking. First of all, we should acknowledge that it's not necessarily adaptive. And in fact, in the complete loss of somebody, or if somebody says they don't want anything to do with you ever again, by all means, you know, if that's expressed clearly, then you need to accept that reality. But the yearning, the desire, and the impulsivity, that kind of leaning in at a almost reflexive way, to try and access that person again, to text them, to want to hear from them, could, and I have to highlight, could reflect the fact that you just so happen to have more oxytocin receptors or maybe more oxytocin overall in this brain area that's associated with motivation and pursuit. It does not necessarily mean that you are more capable of attachment than people who move through grief more quickly. And I should say that people move through grief at different rates. Even if two people lost the same person, or same animal, people move through this at different rates. And some of that is no doubt psychological, but some of it, no doubt, is also neurochemical and biological. And in sharing this with you, I hope it sheds some understanding and perhaps even some compassion for people who are moving through things more quickly or in a different way. And of course it should also, I would hope, shed compassion and understanding

01:18:24 Tool: Complicated Grief & Adrenaline (Epinephrine)

for people that seem incapable of quote unquote moving on. It's taking them far longer to move on. Earlier, we talked about complicated grief, non-complicated grief, and prolonged grief disorder. And I should say that the precise divisions between these categories is not very precise. It takes a really trained expert to be able to identify whether or not somebody is in the prolonged grief disorder category, complicated or non-complicated grief. There's actually a set of questionnaires that I invite you to answer if you like. They were provided, or I should say I accessed them through a public site on Mary-Frances O'Connor's webpage. We'll put them in the show note captions. You actually can submit those answers in an anonymous way to a study that she's doing. She has several surveys, one for loss of a romantic relationship, other for loss due to death of somebody, and still another one that relates to homesickness, and it's also available in several different languages. So I'll provide a link to that website. It's very easy to download. There's no cost to that at all. You can contribute to the scientific data collection process, if you like. And I do believe that you get your scores back or an

interpretation of your scores by participating there. When Mary-Frances O'Connor hopefully comes on the podcast, she can tell us some more of the detail about separating out this prolonged grief disorder, complicated and non-complicated grief. But in the meantime, it's very clear that people move through grief at different rates. And as I mentioned just a moment ago, that this is entirely normal, probably has a basis in neurochemicals and hormones, such as oxytocin. There are probably other reasons as well. In fact, we can assume with almost certainty that there are other reasons as well. Nonetheless, I think it is really important to think about why some people might have a harder time moving through grief due to life circumstance, innate differences, and so on. There's a very nice set of studies, but one in particular, entitled "Catecholamine Predictors of Complicated Grief Outcomes." Here again, the first author is Mary-Frances O'Connor, reminding us that she's done so much important work in this area. This paper has several conclusions, but one of the key conclusions is that this particular category of molecules we call the catecholamines, the catecholamines include epinephrine, which is also adrenaline, norepinephrine, which is noradrenaline, and dopamine, which you've learned about before. Here, I'm just going to paraphrase, or I'll read directly, actually. What they found was that "participants", again, this is human subjects, "with the highest levels of epinephrine, of adrenaline, pre-treatment, had the highest levels of complicated grief symptoms post-treatment, and that could account for their baseline level of symptoms." What this means is that people that have a lot of circulating adrenaline, we might even call these people, people who are, or typically reside at a higher level of autonomic arousal, right? We have an autonomic nervous system that dictates how calm or alert or stressed we happen to be just at baseline. People who tend to be more alert and anxious at baseline, prior to any grief episode, tend to have, or statistically on average, we should say, are more likely to experience complicated grief and maybe even prolonged grief symptoms. So if you're somebody that is anticipating losing someone, or an animal, or a thing at some point, and I think that really means everybody, utilizing tools to adjust your epinephrine, your adrenaline levels down has a number of important benefits, improving sleep, health metrics, et cetera. There are tools to do that. We have an episode on mastering stress that you can find at our website, hubermanlab.com. It has a lot of behavioral tools that are backed by science, some of work that was done in my laboratory, but certainly other laboratories as well, that will allow you to control your autonomic nervous system, both in real time, and reduce the overall level of stress and even chronic activation of the so-called sympathetic arm of the

autonomic nervous system, which is just fancy geek speak for saying, there are tools to help you be calm, not just for sake of navigating daily stress, but as this paper illustrates, for anticipating the fact that at some point, you will lose somebody, an animal, or a thing, and there is a way to move through that process that we call healthy, normal grieving. And then there's the so-called complicated grief, or prolonged grief disorders, that reflect immense challenge in moving through grief at a reasonable rate. So you can somewhat inoculate yourself against complicated or prolonged grief, by reducing your resting levels of, or your pre-loss levels of epinephrine, of adrenaline. And again, there are excellent tools to do that. I won't review them here for sake of time, but they're time-stamped, and you can access those easily. Again, zero cost tools. Going back to this paper, "Catecholamine Predictors of Complicated Grief Treatment Outcomes," should say that not only did participants with the highest levels of adrenaline have the highest levels of complicated grief symptoms post-treatment, but the predictive relationship between these two things, adrenaline and complicated grief, was not seen in depression. And I find that incredibly interesting, because it further separates depression from grieving and grieving from depression. It's a resounding theme again and again. Grieving is not depression, and depression is not necessarily grieving. They can coexist, but they are separable as well, and indeed, reflect separate brain circuitries entirely. So the conclusion they draw is that "The present study supports the hypothesis that catecholamine levels," again, epinephrine, dopamine, norepinephrine are the catecholamines, "are affected by bereavement and in turn, can affect the ability of those with complicated grief to benefit from psychotherapy." So what does all this mean? What this means is, we can prepare ourselves to be in a better state to access, yes, access grief when it's appropriate. And indeed, grief is the appropriate response, when we lose someone, an animal, or a thing that we are closely attached to, and yet, to be able to move through that at a pace and in a way that is most adaptive for us. And to just, again, highlight what adaptive means.

01:24:37 Sentimental Attachment to Objects

It does not mean dissociating from the attachment to the person, animal, or thing. I just want to pause for a second, and mention why I keep repeating person, animal, or thing. I'm saying that because, while grieving the loss of a person, or a relationship with a person, doesn't have to be through death, of course, but death or otherwise is something

that we all can intuitively understand, even if we haven't experienced it. We are capable of achieving great attachments to animals as well. And while the loss of a thing, of an object, in no way, shape or form, approximates the loss of a person or an animal, I would never suggest that it does, it would also be naive and unfair of me or anyone else to suggest that things can't hold immense importance to us, and that the loss of them can feel quite significant, and invoke the grieving process. This isn't always about materialism. Sometimes it's purely about the sentimental attachment. So for instance, the loss of a wedding ring or an engagement ring that was very meaningful to you, or an article of clothing or a painting, or even a small, seemingly unimportant object to somebody else, but something that held great meaning to you, maybe a seashell that you collected with somebody on the beach, and then somehow it gets lost. And it's the relationship with that person that's contained within that object for you, as a representation within that object that's important. That's the reason why I keep saying, person, animal, or thing. I think it's only fair to include things in that category, but of course, with the understanding

01:26:13 Why do Some People Grieve More Quickly? Individual Attachment Capacity

that they don't hold the absolute same magnitude as the loss of a being. One thing that we ought to consider for a moment, is whether or not the depth of attachment that you have to somebody predicts how long it will take for you to move through the loss of that person. We often hear this. Actually, I can remember some years ago, at the end of a relationship, a friend and colleague of mine saying, "You know, for every year that you were together, it's going to take you one month to get over that person." And I thought, "Where in the world did those data come from?" [laughs] And this is what I call anecdata or collective data, where this is like phrases such as, "Absence makes the heart grow fonder." And indeed, sometimes absence can make the heart grow fonder, in the context of two living people or people in a loving relationship, or even in the context of grief and loss. But of course, there's, "Absence makes the heart grow fonder," and then you also will hear, "Out of sight, out of mind." And if you've been listening to this episode, clearly, out of sight does not mean out of mind or out of emotional connection. So these sayings of, "Well, it takes X number of months for number of years," or "out of sight, out of mind," or "absence makes the heart grow fonder," they really don't hold a lot of meaning, at least not for somebody like me, who likes science because science is at least geared

toward or aims towards establishing things in fact, not opinion, but also because science allows you to make predictions. It allows you to orient yourself in a process, and make predictions and understand. So, what are we to think of people who seem very, very attached to somebody? They break up, and they seem just crushed, devastated. But three weeks later, they're in a new relationship and they seem perfectly fine. Or somebody whose spouse dies, and then suddenly they're in a new relationship. I think there are rates of transition, if you will, that suggest some dysfunction, pathology, et cetera. But here we aren't in a position to judge. We're only in a position to speculate about this. And I think we can reasonably speculate that it sort of makes sense why someone who has an intense attachment to somebody might be able to form intense attachments generally, right, that they aren't restricted to one person, whereas other people who have an intense attachment to somebody might find themselves entirely incapable of moving on, or it would take them a very long time, hence the lines in the Feynman letter to Arline about, he had met various other young women. They seemed perfectly nice. And yet, they were meaningless to him in the shadow of her memory, or we should say, in the light of Arline's memory, or the memory of Arline, rather. So these dimensionalities of attachment, they cut in every direction. And I don't think any well-trained psychologist or neuroscientist would ever say, "Oh, if you are somebody who becomes very attached, therefore it's very hard to move on." I think that could be true. It could also be that if you're somebody who has a great capacity for attachment, you have a great capacity for attachment overall. Neuroscience nor psychology is really in a position to judge, certainly, but it's also not in a position to make those kinds of predictions, at least the field, as it stands right now, of attachment and grieving, can't really speak to why that's the case. So that's my attempt to depathologize some of what we observe, although I have to confess, from a just sort of everyday stance, that sometimes the rate in which

01:29:42 “Vagal Tone,” Heart Rate, Breathwork & Grief Recovery

people move out of attachments and grieving can be somewhat eerie. I'd like to take a moment and explore this idea that allowing ourselves to really feel the attachment to somebody can accelerate or at least support adaptive transitioning through grief. There's a really wonderful study that, on the face of it, appears to be a, what we call negative result. A negative result is when a hypothesis is posed, and then turns out the

hypothesis is not true. But as is the case with so many interesting scientific findings, often when there's a negative result, there's a more interesting result nested in that negative outcome. And this is the case in a particular paper I'll share with you now. This is a paper published in the journal "Biological Psychology." And again, the title is posed as a question, which is, "Emotional Disclosure for Whom? A Study of Vagal Tone in Bereavement." What this study explored was whether or not written disclosure of the emotional connection to somebody that was lost would be effective as a way for people to move through the grieving process. The study also explored the so-called vagus nerve. The vagus nerve is an extensive nerve pathway that is bidirectional between brain and body, so brain to body and body to brain. It generally is associated with calming effects on our brain and body, although that's certainly not always the case. The way to think about it in terms of what we're going to talk about now is heart rate and heart rate variability. And in very simplistic terms, if your heart was just allowed to beat at its sort of default rate, that rate would be rather high, because of the activation of the so-called sympathetic arm of the autonomic nervous system, the alertness component of the autonomic nervous system. The parasympathetic nervous system, as it's called, involves calming. We sometimes hear sympathetic is for stress or fight or flight. It's for a lot of other things as well, I should mention, and it is not for sympathy. Sympa simply means together, and it reflects the activity of a bunch of neurons being active at the same time or together, sympa, whereas parasympathetic is often associated with quote unquote rest and digest functions, or calming functions, although it is certainly involved in other things as well. So sympathetic nervous system drives alertness, panic, stress, et cetera. Parasympathetic nervous system, meaning a distinct set of neurons drive calming, falling asleep, digestion, sexual arousal for that matter, and so on. So it's sort of like a seesaw of alertness and calm, alertness and calm, sympathetic and parasympathetic, back and forth. The vagus nerve is generally associated with parasympathetic functions, and has the capacity to slow down our heart rate, in particular, by exhales, and just simply because of the movement of the diaphragm and its relationship to the heart and the thoracic cavity. Exhales result in slowing down of the heart rate. This is what we call an increased vagal tone. So let me explain for a moment. And actually here's a tool you can use, not just in terms of navigating grief, but in terms of stress modulation, generally. We have a muscle called the diaphragm. When we inhale, [inhales] whether or not it's through our mouth or our nose, our diaphragm moves down. As a consequence, there is more space overall in the thoracic cavity. The heart

gets a little bit bigger, believe it or not, volume-wise, blood flows more slowly through that large volume. And there's a signal conveyed from the nervous system to the heart to speed the heart up. So inhales literally speed your heart up. And when you exhale, the diaphragm moves up. And as a consequence, there's less space in the thoracic cavity. Heart gets a little bit smaller. The existing blood volume in the heart at that time moves more quickly through that small volume, right? Given amount of blood volume, make the compartment it's in, the heart, smaller, and the blood moves more quickly through that volume. And as a consequence, the nervous system sends a signal to the heart, via the vagus and other pathways, to slow the heart down. In other words, exhales slow the heart down. That process, that relationship between inhales speeding the heart up, and exhales slowing the heart down, is something called respiratory sinus arrhythmia. Some people are able to engage respiratory sinus arrhythmia more naturally, more reflexively than others. You can actually train this by consciously thinking about slowing your heart rate while you exhale, and consciously thinking about increasing your heart rate as you inhale. You can literally strengthen these pathways. Now, respiratory sinus arrhythmia, and the ability to slow your heart rate with exhales, is one dimension of what's called vagal tone, or your ability to control your overall level of activation of alertness and stress, with these vagus nerve pathways. So vagal tone is something that varies from person to person. If you've trained up or you've thought about your relationship between breath and heart rate, you can improve vagal tone. Some people have very robust vagal tone without having done any training. Other people have less of it, et cetera. I'll just paraphrase from this paper, and you'll see where this takes us in terms of navigating grief, because it's quite important. "The vagus nerve provides inhibitory regulatory influence on the heart, allowing the heart rate to increase rapidly through vagal withdrawal," that means kind of coming off the break of the parasympathetic nervous system, "as in response to a stressor in one's environment." Right, when you're stressed, you rarely take the opportunity, if it's an immediate stress or threat, to actively exhale, although that would be a great tool to use. And in fact, we promote that tool in our "Mastering Stress" episode. "Vagal withdrawal usually co-occurs with an increase in sympathetic activation of the heart." You now know what that is, "or is known as the fight or flight response. Vagal tone reflects the degree to which there is tonic," meaning ongoing, "vagal influence on the heart." So when you have a high degree of vagal tone, it means that you are always activating that break on your stress system, just at default. And some people just happen to do that more. Other people need to practice long

exhale breathing in order to build up vagal tone, something that's very useful to do, whether you're grieving or not. Now in this study, what they did is they had people, and I should say it was 35 participants, go through a writing exercise for a period of weeks. They actually wrote about three times per week. Then there was a follow up at some period of time, and then again, about a month later. And there were two different groups. One group was in the so-called written disclosure group. What they did is they, on day one, they would write about what happened when a loved one died. And indeed they used people who had experienced real loss. And so they were asked to talk about and write about their deepest emotions and thoughts about it, memories of their loved one, very intense stuff, if you think about it, if they're in the immediate period of having lost someone. Then they actually were asked to write a letter to the person that they lost. So again, a very intense exercise to go through, if you did indeed lose somebody as these subjects had. And then of course there was the testing, some period of time later, and I'll tell you what that period, what that testing involved. The other group was a so-called control group, where they were simply told to write about how they use their time. So an emotionally kind of empty writing exercise, if you will. They described what they did today after they woke up, et cetera, no heavy emotional content, and so on. Now, as I mentioned earlier, the immediate results of this study were a negative result, meaning no effect. The disclosure that, we should say, the emotionally intense writing group and the control group did not differ at baseline on any symptom measures or psychological variables, they tell us, and at least at face value, somewhat disappointingly, there really wasn't any kind of difference in outcome between the group that wrote about the very emotionally intense stuff versus non-emotionally intense. Now, what I didn't tell you thus far is why they had them do this exercise at all. They had them do this exercise because many of the effective practices for moving through grief involve, as I mentioned earlier, getting close to and actually deliberately experiencing the attachment that one has to that person that was lost, not distracting one's self, not getting into this counterfactual thinking, the what if, what if, what if, but rather thinking about, or in this case, writing about the real attachment. And so the initial idea was, if people write about this attachment, that they're going to experience this attachment, and that will serve them in some or many ways, in terms of moving through grief. And that wasn't what they found. They found no difference between the two groups, until they explored who had higher vagal tone, who had a greater degree of so-called respiratory sinus arrhythmia. In other words, who was able to modulate their state, using their breathing and their body. And

what they discovered was that a subset of individuals who had a high degree of vagal tone seemed to get more benefit from this writing-type exercise. Now, this is one study, and I would consider it fairly preliminary with 35 subjects. Although, you know, it's a study unto itself and I think a quite nice one, and it really set the stage for a number of other studies that followed, from this group and other groups, that really point to the fact that yes, indeed, accessing these states of emotionality by writing or thinking about somebody is quite powerful in terms of engaging the bodily states and the mind states associated with the attachment. And that is very beneficial for moving through grief. That is very beneficial for sensing the attachment. And now it makes perfect sense as to why some people would benefit from that sort of practice more than others, because some people are able to access more real somatic feelings of attachment by writing about the attachment, or by thinking about it, than others. So this brings us back to an earlier discussion we were having, where we were talking about how some people seem to move through things very quickly, or don't seem to be grieving constantly, and a spouse or a family member of that person might think, "Gosh, why aren't you upset? How is it that you can be functional and I'm not," or, "how is it that you can be functional?" There can even be fractures in families and relationships on the basis of differences in rates of grieving and so on. Well, some of this, again, probably relates to psychology and the different attachments that people had to the person or animal or thing that was lost, but it no doubt also has to do with how much of a mind/body connection, how much vagal tone exists in the person, when they suddenly found themselves in the grief episode. So this actually offers multiple opportunities. If you're somebody, for instance, who is grieving so intensely and so often that you're finding it immensely difficult to move through grief at a reasonable rate, and you might even say, or find yourself diagnosed with prolonged grief disorder or with complicated grief syndrome in a way that's really impairing your adaptive functioning in life, well then, it's not clear to me, at least by my read of the data, that you would want to engage in a lot of practices to increase the mind/body relationship and feeling so much of this attachment, because you're already feeling an immense amount of it. Whereas other people who are feeling challenged in accessing the feelings of attachment, and perhaps not functioning well as a consequence of that, might find that practicing breathing in order to encourage respiratory sinus arrhythmia, again, focusing on slowing your heart rate consciously while you exhale, and concentrating on increasing your heart rate as you inhale, even just as a brief practice of even just one to three minutes or one to five minutes, every once in a while or per day, that could be

immensely beneficial in building this mind/body relationship. Because again, what this paper really points to and set off a number of other investigations related to, is that for those that can really feel the relationship between breathing heart rate, what we call vagal tone, well, those people are going to be in a better position to move through grief, not because they are disengaging from the feelings of attachment, but because they are better able to access those feelings of attachment. So what this relates to of course is that tripartite map, that three-part map that we talked about earlier, that representation of space, where things are, where the person is, where their belongings are, where their car is, where their bicycle is, time, when you were expecting to see them on a regular basis, when they would call, when they would come home from work, et cetera, and that third node, or that third dimension of attachment, which is literally attachment and closeness. Well, what we're talking about here is anchoring to that attachment and really feeling into that, but then disengaging from the space and time map that we call episodic memory, that menu of prior experiences, that keeps us in many ways,

01:42:32 Complicated Grief & Cortisol Patterns

maladaptively in an expectation of what never can be again. Now I'd like to take a moment and consider some of the tools that you can access that support healthy transitioning through grief. And these are tools distinct from that neural map, that space, time and closeness attachment map that we were talking about before. Rather, it's important to remind ourselves that everything exists in a context of our baseline physiology. And I'm certainly not going to be the first or the last to tell you that everything in life, learning, relationships with people that are still around, our health in every way, immune system, et cetera, function far better when we're sleeping really well, and when we are generally awake during the daytime and asleep at night. I realize there are shift workers out there, people who are traveling and are jet-lagged. First of all, thank you, shift workers. We rely on you. We have an episode all about jet lag and shift work, for you and for trying to maintain the best possible mental and physical health in the face of ongoing shift work and jet lag. You can find that episode on our website, hubermanlab.com. Lots of behavioral tools, some other tools as well. Nonetheless, human beings are diurnal. We were really designed to be awake mostly in the day and asleep at night. There are rare exceptions to this where people like to stay up late and sleep in late. But we are a diurnal species, by way of our genetic wiring and our neural

circuit wiring. There's a particular feature to our diurnal, and diurnal, meaning the opposite of nocturnal, our diurnal pattern of the release of a hormone called cortisol. Cortisol is a stress hormone, it's sometimes called, but cortisol has a lot of other effects, many of which are positive. Cortisol for instance, protects us against infection. It can help us in terms of waking up in the morning. In fact, the pulse as it's called or the spike in cortisol early in the day is part of the reason we wake up. It's linked to our increase in temperature rhythms, and can further increase our temperature, which leads to waking, and so on. The typical pattern of cortisol in a healthy individual, and we really can say physically and emotionally healthy individual, is that cortisol is going to be somewhat high right around waking, and then is going to be highest as it ever will be in the 24-hour period, about 45 minutes post waking, not exactly 45 minutes, but about 45 minutes. And then it will drop gradually, such that by about 4:00 p.m. in the afternoon, which is actually when body temperature tends to start to drop as well, cortisol tends to be very low, and then remains low in a healthy individual, such that at 9:00 p.m., it's very low. And throughout the night as we sleep, it's very low. In fact, spikes or pulses in 9:00 p.m. cortisol are a fairly reliable biomarker readout of certain forms of depression and chronic anxiety. This relates to the beautiful work of my colleagues at Stanford and Stanford School of Medicine, Dr. David Spiegel, who's been on this podcast, and Dr. Robert Sapolsky, who has also been on this podcast. There's a very interesting paper exploring the relationship between cortisol rhythms and grieving, in particular, complicated versus non-complicated grieving. Again, complicated grieving being the form of grieving that reflects a immense challenge of people moving through the grieving process, such that it really needs to be dealt with, right? Again, grieving is healthy, but complicated grieving is a prolonged grieving, and has other dimensions as well, hence the name complicated. The title of this paper is, "Diurnal Cortisol in Complicated and Non-Complicated Grief, Slope Differences Across the Day." And the figure to orient to in this paper, if you do decide to check it out, and we'll put a link to it, is Figure One, which beautifully shows, or I should say very clearly shows, that in individuals that are experiencing complicated grief, there's the same general contour of high cortisol upon waking, even higher about 45 minutes after waking, and then a reduction in cortisol by 4:00 p.m., and even further reduction by 9:00 p.m., so just as it were in a typical individual, or somebody who is in non-complicated grieving. However, when you compare the cortisol levels between people experiencing complicated grieving versus non-complicated grieving, what you find is the 4:00 p.m. and 9:00 p.m. cortisol levels are significantly higher than they are in

the non-complicated grieving group. This raises a very interesting idea, and relates very closely to what we were talking about with vagal tone. You could imagine a situation in which people who are experiencing complicated grief have higher levels of afternoon and nighttime cortisol, because they are in complicated grief, but you could also imagine the opposite, that they're experiencing complicated grief because of the fact that they have elevated cortisol. Now, it's very likely that it's bidirectional, that the answer isn't one or the other, but both, that complicated grief changes patterns of cortisol, and that patterns of cortisol change the likelihood that one has complicated grief. That's the most logical interpretation of data like these. However, when taken along with the data on vagal tone, that people who have a higher level of vagal tone are better able to navigate situations of the sort that we're talking about, and that some people perhaps have oxytocin receptors or patterns of catecholamines or epinephrine, that position them to be more likely to grieve in a particular way, we arrive at a scenario where it makes very good sense to think about modulating, that is controlling the foundation of your life, in a way that establishes cortisol rhythms, and sleep patterns, and patterns of autonomic arousal and catecholamine release that position you to navigate the grief process in the best possible way. If that was a complicated mouthful to digest, let me restate it in a simpler way. If you are somebody who is heading into grief or is challenged with grief, complicated grief, or otherwise, prolonged grief or otherwise,

01:48:50 Tool: Improving Sleep & Grieving

getting adequate sleep at night and establishing as normal a pattern of cortisol as possible is going to be very important. And there's a very simple, straightforward way to do this. And I apologize to the listeners of this podcast in advance, if I sound like a repeating record, but the most powerful way to do this is to view sunlight, very close to waking. It does not have to be right at sunrise, but when you get up in the morning, if the sun isn't out, please turn on as many bright lights as possible in your environment. And then once the sun is out, try and get some bright sunlight in your eyes. Never look at any light so bright that it's painful to look at, sunlight or otherwise. If you live in an area of the world where there isn't a lot of sunlight, please keep in mind that sunlight coming through cloud cover is going to still be a very effective mechanism for establishing this cortisol rhythm. Why do I say this thing about sunlight over and over and over again? Well, having an early day cortisol peak and a very low cortisol level late in the day, 4:00 p.m.

and 9:00 p.m., is immensely beneficial. It's, reflects a properly regulated autonomic nervous system. It means being alert during the day. And your ability to sleep at night is tightly correlated to this viewing of sunlight in the morning. If you have additional questions about this or these protocols, please see our "Mastering Sleep" episode also at hubermanlab.com. But in brief, you don't want to wear sunglasses when you do this. You do not want to do this through a window or a windshield. It is 50 times less effective at least, because of filtering of the proper wavelengths. It is fine to wear eyeglasses, meaning corrective lenses or contacts, even if they have UV protection. Again, sunlight is best 10 minutes to 30 minutes, depending on how bright it is outside, and so on and so forth. I keep coming back to this protocol, because first of all, it is a zero cost, but very effective way to regulate things like cortisol rhythms, melatonin rhythms, wakefulness during the day, ease of falling asleep at night, and so on, and second of all, because I want to emphasize this idea of modulation. There are processes in our brain and body which directly mediate some psychological effect or physiological effect, right? Dopamine is directly involved in motivation. If you're somebody who struggles with motivation, your dopamine system is likely to be dysregulated in some way. And there are behavioral tools and other tools to adjust that. We had an episode on dopamine motivation and drive that talks extensively about those tools. However, the process of grief can't be distilled down to one molecule, one circuit, such that we can say, "Oh, you know, take this supplement or eat this diet and/or exercise in the following way, and you'll recover from grief more quickly." It's simply not the case. It is the case, however, that proper sleep at night sets the foundation for the proper emotional tone, to be able to navigate physical, psychological, and other types of challenges, and not incidentally, sleep at night, I should say, sufficient duration and quality of sleep at night is the way in which you engage neuroplasticity, the reordering of neural connections, and everything we've been talking about today about reordering of the maps in your mind. This tripartite, three-part map of space, time, and closeness involves neuroplasticity, the reconfiguring of connections between neurons, strengthening certain pathways, and not strengthening others, actively trying to disengage from the what if, right, this counterintuitive thinking, actively trying to disengage from the expectations that someone will be there, although when you find yourself doing that, understanding why it's so reflexive and normal to do that, actively trying to lean into the real attachment to somebody, animal, or thing, and yet at the same time, not deluding yourself and undermining the whole process of grieving, by trying to imagine that they are in fact still, truly there, right? It's a very narrow

knife edge of a process, which is why it's so challenging. Regulating your cortisol rhythm through viewing sunlight early in the day, and I should also say, avoiding bright lights from artificial sources in the evening, generally 10:00 p.m. to 4:00 a.m, but certainly in the evening, trying to dim lights in your immediate environment, trying to avoid bright screens, bright artificial lights as much as possible, and accessing that deep sleep, that's modulating, it's setting an overall autonomic state or an overall autonomic landscape, would be the better way to describe it, that's going to allow you to sleep and get neuroplasticity, sleep and be in the best emotional state to navigate the grieving process. Because it's only fair to say that the grieving process as we're describing it is hard, and not just because it's emotionally hard. It's cognitively hard. You just think about what's required to move through grief properly, if you will. It's thinking about, and actually physically experiencing the depth, the full depth of the attachment to the person, while at the same time trying to uncouple from that rich menu, that catalog of episodic memories that can date back many, many years and have so much richness. So many predictions form on the basis of those episodic memories, and actively trying to distance ourselves from those memories, by being very anchored in the fact that we are present, we are the person alone in that room, or in some cases with a bereavement group in that room, or with other people that are mourning the loss of that individual, animal, or thing, and that knife edge of feeling the intense attachment, while also disengaging from all the things that led to that attachment. Well, it's understandable why that would be so challenging, and it should also be understandable

01:54:28 Tools: Grief Processing & Adaptive Recovery

why positioning yourself to be able to do that in the best possible way requires proper sleep. So what are the tools that we can think about using, in terms of healthy, adaptive moving through grief, trying to avoid complicated grief and prolonged grief disorders? I realize that word disorder implies all sorts of things, but again, those are just naming categorizations that people come up with, that I think fairly reflect the fact that some people have more challenge moving through grieving than others. And for some people it can be very extended. I think the common misunderstanding is that proper grieving involves moving through something quickly. We're certainly not saying that. However, it is very clear that some people can get stuck, and that process of getting stuck, you should now understand, has a lot to do with maintaining or reactivating those episodic

memories, those expectations of where somebody will be in space and time. So what can we say about the tools for moving through grief? Clearly it's of value to dedicate some period of time, perhaps every day, perhaps every other day, depending on your capacity and schedule. These could be periods of time ranging anywhere from five to 45 minutes, maybe longer. These blocks of time would be appropriately described as rational grieving, right? Rational grieving is a clear acceptance of the new reality that the person, animal, or thing no longer exists in the same space/time dimensionality that we knew them before, and yet holding on to an anchoring to the attachment that we had. This is again, not an unhealthy anchoring to the attachment. This is really anchoring to the depth and the intensity of the attachment that existed, as a way to, for lack of a better way to put it, push off from those episodic memories, to distance ourselves from them. Because those episodic memories are the ones that lead us to look for the person in our current reality. And assuming this is a real and complete loss, those sorts of expectations are maladaptive. They do not serve us well. The second aspect of this is to understand that the node of the map, the component of the neural map that you're anchoring to, is a very real component of you. These are literally cells that represent the depth of attachment. They are linked up with your emotional centers in the brain, and indeed they're linked up with your body. I think one of the things that comes up so often when people are grieving is why does it hurt so much? Well, that hurt is that yearning. It's that anticipation of action that you want to engage in, but some part of you at least knows that it leads nowhere. It's that reaching for that glass of water in a kind of desert of thirst, and you know you can't have it. That's why it hurts so badly, because the systems of your brain and body are in a place of anticipation of readiness. And given the activation of these brain reward systems like the nucleus accumbens, given your now understanding of oxytocin, being more enriched in the nucleus accumbens of some individuals and as opposed to others, it should make perfect sense as to why it's so painful in your body. We talked a moment ago about the importance of accessing quality sleep on a regular basis, gave you at least one tool to do that. There are again, a rich array of tools to do that in the "Mastering Sleep" episode. And again, highlighting the importance of sleep for not just emotion regulation and autonomic control, which is so vital, but also for making sure that neuroplasticity takes place. Because again, neuroplasticity is a two-part process. There's the triggering of the plasticity, which in the case of the things we're talking about today, will be naturally activated by the practice of a dedicated focusing on the attachment, feeling the attachment to the person, maybe

even writing about the attachment to the person, as was described in that previous study, but also just the plasticity is triggered by the mere loss of that person, the intensity of that experience. But neuroplasticity, the literal rewiring of connections, occurs during deep sleep and in what I call non-sleep deep rest or NSDR. And you can find NSDR scripts, these are short behavioral protocols that you do for 10 to 30 minutes at some point throughout the day, maybe even multiple times through your day, that have been shown to accelerate neuroplasticity. So having a such a practice can be very useful, and understand that it involves some cognitive work. We have to hold onto the attachment, and imagine and feel as much as we can, the attachment, while also being extremely rationally grounded, and trying to not try to hold onto the past, trying to not anticipate the person walking in the room. This is very hard because when we think about the attachment, the attachment tends to drag with it those episodic memories, that rich catalog of experiences. The expectation that they will walk in the room is perfectly natural. The hard cognitive work is to experience the deep, emotional attachment, while at the same time severing from or distancing ourselves from these expectations that they'll suddenly show up in our reality, when in fact, they won't. And we talked about preparing ourselves for grief, right? If we have a loved one that's dying, or we anticipate that at some point we are going to have a loss of some sort, could be death, could be a loss of another type, breakup, et cetera, that we can prepare ourselves to grieve more adaptively by regulating the level of catecholamines, in particular epinephrine, that was well-described in the study that I referred to earlier, and tools such as the one found in our "Mastering Stress" episode, and tools of the sort that we talked about today, increasing that vagal tone by actively building up the relationship between exhales and slowing down of the heart rate, so-called respiratory sinus arrhythmia. Those things can be very useful tools. So we can actually encourage our nervous system and build our nervous system and build our mind to prepare for grief when it inevitably will come. Again, this is not about buffering ourselves from the realities of life. This is not about disengaging from grief as a real and important process. And indeed, it is a real and important process to engage in. Those that enter denial, or try and distract themselves with substances or thinking or distracting of behavior, substances or otherwise, won't move through grief as well, as adaptively, as those who embrace a process of the sort that I'm describing here. And of course, I want to restate again, that even though grief and depression are now known to be fundamentally different, even though people move through the different stages of grief at different rates and sometimes skip stages, et

cetera, it is often important to access a trained professional psychologist, or psychiatrist, or both, or bereavement group, or all of the above, in order to get the proper support for grieving. So this is a podcast about science and science-based tools, but I absolutely want to emphasize that there are terrific resources out there that you can access. I don't say this in any kind of glib or kind of pass the buck kind of way. There are wonderful trained therapists, bereavement groups, psychiatrists that are expert in navigating these sorts of things. I like to think that the tools that we've talked about today would be not only compatible, but would be complementary to the sorts of approaches that they take. And as we think about this process of grief, as we all should at some point in our lives, because we all indeed will experience grief in one form or another, I would hope that the information that we discussed today would not only give you some tools, but hopefully give you a better understanding of not just the people that you've lost or that you stand to lose, not just the animals that you've lost and stand to lose, but also give you a sense of why it is that the people who are still in your life and that you're attached to, the animals that are still in your life, that you're attached to, have such profound meaning for you. And I would encourage you to not lean away from, but rather to lean into the building of those episodic memories, to build up a richer and richer set of experiences and emotional attachments. Because while the process of grieving is in direct relation to how close we are attached to people, there are ways to move through it. And of course it is the depth of our attachments, and the number and the depth of meaning of experiences that we share with others and with animals that makes life so rich and worth living. So I just want to take a moment and say thank you for being willing to explore this rather complicated, and sometimes extremely challenging thing that we call grief, from the perspective or through the lens of neuroscience and psychology. I certainly learned a lot in exploring this literature. I also really look forward to hosting people like Dr. O'Connor on the podcast, and others on the podcast who've done such beautiful work in this area. I've put out the request, and hopefully they'll join us soon

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to further elaborate and teach us about this fundamental component of our lives. If you are learning from and are enjoying this podcast, please subscribe to us on YouTube. That's a terrific zero cost way to support us. In addition, please subscribe to the podcast

on Spotify and Apple, and at both Spotify and Apple, you can leave us up to a five star review. If you have comments and suggestions, feedback, or you'd like to see a particular guest on this podcast, please put those suggestions, comments, and feedback in the Comments section on YouTube. In addition, please check out the sponsors mentioned at the beginning of today's podcast. That's the best way to support us. Not during today's episode, but on many previous episodes of the Huberman Lab Podcast, we've discussed supplements. While supplements aren't necessary for everybody, many people derive tremendous benefit from them, for things like easing and accelerating the transition time into sleep, and getting better, deeper sleep, as well as things such as focus, et cetera. We've partnered with Momentous Supplements, because Momentous Supplements, first of all, are of extremely high quality. That's obviously important. Also, they ship internationally. We had heard from many of you that you were having trouble accessing some of the supplements that were described on the Huberman Lab Podcast, because you did not live in the U.S. Momentous ships both within the U.S. and abroad. And many of you have also requested that there be a single site where you could access all of the supplements that we've talked about on the Huberman Lab Podcast. Right now at livemomentous.com/huberman, you can find a subset of the supplements that have been described on this podcast. Again, all of the very highest quality. Each, single-ingredient supplements. That turns out to be very important if you're trying to develop the proper array of supplements for you. It's not helpful to have supplements that include many ingredients, so we encouraged Momentous to have single-ingredient supplements with dosages that allow you to build up from the minimal effective dose, and so on. And the catalog of supplements they are going to add to that location, livemomentous.com/huberman, is going to expand in the weeks and months to come. And we expect that in a fairly short amount of time, all of the supplements that we've described on the Huberman Lab Podcast will be there. If you're not already following @hubermanlab on Instagram and Twitter, I post science and science-related tools @hubermanlab on Instagram, also @hubermanlab on Twitter. Oftentimes that material will overlap somewhat with the content covered on this podcast, but more often than not, what I'm covering on Instagram and Twitter is distinct from the information I cover on the Huberman Lab Podcast. We also have a newsletter that has summaries of podcasts, and points to specific protocols and links that could be useful to you. That is the Neural Network Newsletter, and you can find it at hubermanlab.com. Go to the menu, go to Newsletter. You can sign up simply by giving us your email. We do not share your email

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