

## Using Play to Rewire & Improve Your Brain | Huberman Lab Podcast #58

In this episode, I discuss the transformative nature of play—how it changes our feelings, thoughts and actions and indeed, how it can rewire our brain to function better in all contexts. I explain the role of play in childhood, as well as adulthood in skill and social development and describe key characteristics of the mind and body during play. Additionally, I explore how play allows the brain to test contingencies in different roles/environments. Throughout, I discuss the underlying neurobiology of play. I also describe how low-stakes play, and tinkering can broaden and shape your future capabilities. Finally, I discuss how our childhood ‘personal play identity’ informs our adult personality. Throughout the episode, I use the science of play to outline recommendations for using play as a means to enhance neuroplasticity and explore novel situations, regardless of age.

#HubermanLab #Neuroscience #Play

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- Welcome to the Huberman Lab Podcast, where we discuss science and science based tools for everyday life. [Upbeat music] I'm Andrew Huberman, and I'm a Professor of Neurobiology and Ophthalmology at Stanford School of Medicine. Today, we are going to talk about the biology, psychology and utility of play. Play is something that normally we associate with children's games and indeed with being a child, much of our childhood development centers around play, whether or not it's organized play or spontaneous play, but as adults, we also need to play. And today I'm going to talk about what I like to refer to as The Power of Play. The Power of Play, resides in play's ability to change our nervous system for the better, so that we can perform many activities, not just play activities, better. Play can also function as a way to explore new ways of being in different scenarios in work, in relationships, in settings of all kind, and indeed also in the relationship to oneself. In fact, we are going to explore how assuming different identities during the same game of play or the same forms of play has been shown to be immensely powerful for allowing people to engage in more creative thinking and dynamic thinking and indeed to better leaders and more effective workers and students and learners and happier people. I'm also going to cover some data that shows that learning to play properly can enhance one's ability to focus and is an active area of research for

treatment of things like ADHD, Attention Deficit Hyperactivity Disorder, just as a little sneak preview of where that's headed, children who do not access enough play during certain stages of childhood are more prone to develop ADHD. The good news, is all of us regardless of whether or not we have ADHD or not, whether or not we had ample access to play during childhood or not, can engage and grow the neural circuits that allow for this incredible power of play. And this can be done again at any stage of life today. We're going to talk about the protocols, the science, we will review all of that. And I promise you'll come away with a lot of knowledge, whether or not you're a parent, whether or not you're a child, whether or not you're a person of any age,

00:02:23 Tool: Reading on Smart Phones, Sighing & Learning

you're going to have tools and knowledge that will benefit you. Before we begin, I want to share with you the results of what I think to be an extremely exciting and certainly an actionable study that was just published in the journal Scientific Reports. This is an excellent journal Nature Press journal, Peer Reviewed, et cetera, and the finding center around what sorts of devices we happen to be reading on and accessing information on and how that's impacting our physiology and our capacity to learn. One of the more frequent questions I get is what are all these devices, phones, tablets, computers, video games et cetera, doing to our brains. And finally, there's some good Peer reviewed data to look at that and to address it directly. This study, first author Honma H O N M A Honma et al, is entitled "Reading on a smartphone affects sigh generation. That's SIGH sigh generation brain activity and comprehension." And to just summarize what they found, they ran a study on 34 healthy individuals and had them either read material on a smartphone or on regular printed paper or a book. And what they found is that comprehension on devices in particular smartphones is much poorer much worse than it is when one reads on actual paper. Now some of you may experience this yourselves. Now they compared smartphones with paper. And what they found was that when they looked at people's breathing, the normal patterns of breathing that people were engaging in did not differ between people reading on a smartphone or reading from paper. However, one particular feature of breathing did differ. And that particular feature is what we call physiological sighs. I've talked a lot about physiological sighs on this podcast, and on social media, we had a terrific guest, Professor, Jack Feldman from University of California Los Angeles. Who's a world expert in breathing and respiration

and its impacts on the brain and how brain controls breathing and respiration and what you can learn from that episode. Or I'll just tell you again right now, is that every five minutes or so, whether or not we are asleep or awake, we do what's called a physiological sigh, which is a big, deep inhale, often a double inhale followed by a long exhale. It goes something like this. [Inhaling] [Sighs] Now you might think, oh, I never breathe like that, but you do, unless there's something severely wrong with your brain stem every five minutes or so you do one of these physiological sighs, which reopens all the little hundreds of millions of sacks in your lungs called alveoli that bring in more oxygen as a consequence of that big deep, double inhale. And then you are able to exhale carbon dioxide, offload carbon dioxide through that long exhale. I've also encouraged people to use the physiological sigh deliberately, not just spontaneously as a way to reduce their stress quickly. And indeed my lab works on physiological sighs and it's been exploring this and they're quite effective in reducing our stress very fast. Reading on our smartphone, seems to suppress physiological sigh. People aren't aware that it's happening, but it's happening. Some people have talked about so-called email apnea, which is the fact that people hold their breath while they email or while they text. And indeed many people do that. This is distinct from email or texting apnea. What's happening here is people are reading on the phone and for whatever reason, and I'll talk about what the likely reason is, but for whatever reason, they're suppressing their sighing. And as a consequence, the brain is not getting enough oxygen and is not offloading enough carbon dioxide. And another finding in this study, was that the prefrontal cortex, an area of the brain that's involved in focus and attention and learning becomes hyperactive in a kind of desperate attempt to focus. All of this can be summarized by saying, if you happen to read on a device, whether or not it's a tablet, a standard computer screen of any kind, but in particular on a smart phone, regardless of how small or large that smartphone screen is, you want to remind yourself to engage in these physiological sighs fairly regularly. And it might even be better to just read the most or at least the key issues and things that you're trying to learn about the key information from paper, either books or printed out material of some other sort. What's the underlying mechanism here? Well, one of the reasons I like this study so much, is that it brings together two of my laboratories and my particular interests in neuroscience, which is how does our visual system and the aperture meaning the size of our visual window relate to our so-called autonomic function or our internal state. And basically what's happening here is as any of us bring our visual window in more narrowly as we

contract our visual window, which is exactly what happens when we're looking at a little smartphone in front of us. It seems to suppress the breathing apparatus because we know that physiological sighs are controlled by a specific set of neurons in the brain stem called the parafacial nucleus discovered by Dr. Jack Feldman. And so there must be a mechanism whereby when we tighten our visual window, we somehow, and we don't know yet how this happens, but somehow suppress the activity of these neurons in the parafacial nucleus that generate this physiological sighs. So again, you have two choices or I suppose you have many choices, but two main choices to contend with this new information. One is that you remind yourself to engage in deep breathing and in particular, physiological sighs every five minutes or so, while reading anything or texting on your smartphone, the other would be, again, if there's material that you really need to learn for sake of regurgitation later, or for something particularly important, try and read that from either a larger screen or even better would be from printed materials or books. Another reason I bring all that up is that it relates to a larger theme, which is that I get many, many questions about ADHD and about people's challenges with focus and much of what we're told these days is that we are challenged with focus because of the hundreds of videos that we can see streaming by us in any moment on our phone, which probably is true. The fact that the information that we're reading on the internet and on our phones is emotionally disturbing or distressing in some way. And that probably is true as well in many cases. This study really points to the fact that independent of the information that we are looking at or consuming independent whether or not it's movies or texts or anything of that sort, the mere size of the window, the aperture, the screen that we are looking at is also strongly impacting our ability to learn and remember information. So broaden that visual window print things out, look at a book. I didn't design the system. I always say, you know, however our visual system and respiratory system happened to evolve. I wasn't consulted at the design phase. This is just simply how your brain circuits work. So if you want to learn things, widen that visual window and even better print things out, pick up a book or read on a tablet even,

00:09:14 AG1 (Athletic Greens), Roka, Helix Sleep

but try and make that tablet larger than a smartphone screen size. Before we begin our discussion about The Power of Play, 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 Athletic Greens also now called AG1. I started drinking Athletic Greens way back in 2012. And so I'm delighted that they're sponsoring the podcast. Athletic Greens is an all in one vitamin mineral probiotic drink. The reason I started drinking it in 2012, and the reason that I still drink it once or twice a day, is that with Athletic Greens, I cover all of my basic foundational vitamin mineral probiotic needs. It's filled with adaptogens for recovery. The probiotics are particularly important because they encourage health of the so-called gut microbiome. We're going to be talking a lot about the gut microbiome on this podcast in the weeks and months to come, but to make a long story short, we have a lot of bacteria living in our gut that are healthy bacteria that support them like digestion immune system, metabolic function, hormone systems. And perhaps most interestingly to me, the gut microbiome supports brain function, including mood cognition and so forth. The probiotics in Athletic Greens strongly support the gut microbiome and thereby the other systems of the body, including the gut brain access, which I just referred to. If you like to try Athletic Greens again, also called AG1, you can go to [athleticgreens.com/huberman](https://athleticgreens.com/huberman) to claim a special offer. They're giving away five free travel packs and a year supply of vitamin D3, K2, vitamin D3 is extremely important for many biological functions. We are told that we can get enough D3 from sun exposure, but many of us we're getting sun exposure. And many of us who are not getting enough sun exposure still don't have ample levels of vitamin D3 So supplementing with vitamin D3 is necessary for many many people. And K2 is important for cardiovascular function for proper calcium balance, et cetera. So again, if you go to [athleticgreens.com/huberman](https://athleticgreens.com/huberman), you can get the five free travel packs a year supply of vitamin the D3 K2, and of course your Athletic Greens. Today's episode is also brought to us by ROKA. ROKA makes sunglasses and eyeglasses that are of the absolute highest quality. I've spent a lifetime working on the visual system. And one of the many challenges that your visual system has to deal with is for instance, when you move from a bright environment to a dimer environment, you have to adapt. You have have to be able to see things clearly, many sunglasses and eyeglasses don't allow that adaptation to occur seamlessly, ROKA sunglasses and eyeglasses allow that to occur in concert with your biology and in a way that makes it very seamless. You just don't notice the transition at all, which is wonderful. I love it 'cause I don't have to constantly be taking off and putting on my sunglasses when I'm outside. I happen to wear readers at night, eye

glass readers. It's also terrific as the luminance in your environment changes. So they work under low luminance, high luminance, et cetera. They're very lightweight. In fact, you can wear them when running, when cycling, they were designed by two All-American swimmers from Stanford. And so originally they were designed for the purpose of being worn during exercise, but you can wear them anywhere. They have a great aesthetic, so you can wear them to dinner, to work, et cetera. And while a lot of performance eyeglasses out there, in my opinion, make people look like cyborgs, ROKA sunglasses and eyeglasses have just a terrific aesthetic that you can wear truly anywhere. If you'd like to try ROKA glasses, you can go to [roka.com](http://roka.com) that's ROKA.com and enter the code Huberman to get 20% off your first order. Again, that's ROKA ROKA.com and enter the code Huberman at checkout. Today's episode is also brought to us by Helix Sleep. Helix Sleep makes mattresses and pillows that are second to none. I started sleeping on a Helix mattress about a year ago now, and it's the best sleep that I've ever had. What's unique about Helix mattresses is that they tailor their mattresses to your sleep needs. So if you go to their website, you can take a brief two minute quiz that asks questions like, do you sleep on your stomach or your back or on your side, maybe you don't know, do you tend to run hot or cold throughout the night? Or maybe you don't know, and it matches you to the mattress. that's perfect for your sleep needs. I matched to the so-called Dusk mattress, D U S K, because I wanted a mattress that wasn't too firm and not too soft. And so I sleep on a Dusk mattress. You should figure out what mattress would be ideal for you. If you're interested in upgrading your mattress, you can go to [helixsleep.com/huberman](http://helixsleep.com/huberman), take their two minute sleep quiz and the match you to a customized mattress. And you'll get up to \$200 off any of your mattress orders and two free pillows. Again, that's \$200 off and two free pillows. The pillows are excellent. I also use Helix pillows. They have a 10 year warranty. You get to try out the mattress for up to a hundred nights, risk free. If you don't like it, they'll come pick it up, take it away. But I think you'll love it. Again if interested,

00:13:57 Homeostatic Regulation of Play

you can go to [helixsleep.com/huberman](http://helixsleep.com/huberman). There can get up to \$200 off and the two free pillows. Let's talk about play. Now in researching this episode, I thought that I was going to come across a bunch of papers that say this brain area connects to that brain area, which controls play in animals. And there's similar areas in babies and in adults. And



indeed, that's true. And we will talk about brain circuitry, but I think more importantly is to understand what is the utility of play? You know, why do we play when we're younger? Why do we tend to play less as we get older? And what in the world is play for? Some of us would be categorized as more playful. I'm sure that you know, people like this, maybe you are like this people that can walk into a room, a social setting of any kind, and they seem to already kind of have a playful, maybe even a mischievous quality about them. We'll talk about mischief a little bit later, but they sort of look at an environment or a social setting as an opportunity for different kinds of novel interactions. Other people and I'd probably put myself into this category. If I walk into a novel environment, I tend to be more in the mode of just assessing what that environment is like. I'm not a particularly spontaneously playful person, although around certain individuals, I might be more spontaneously playful. We are all on a continuum of this kind of seriousness to playful nature. Turns out that all young animals, including humans have more playfulness and tend to engage in more spontaneous play in their earlier years than in their later years. And therein lies a very interesting portal to understanding what the utility, what the purpose of play is. First of all, I want to lay down a couple of key facts about play that point to the fact that play is not just about games. Play is about much, much more and play and in particular, how we played as a child and still how we can play as adults is really how we test and expand our potential roles in all kinds of interactions. One of the most important, interesting and surprising features of play that I'd like everyone to know about is that it is homeostatically regulated. Some of you are familiar with the term homeostasis. Homeostasis is just this aspect of biological systems to try and remain in balance. You know, if you stay awake for a long period of time, you tend to want to sleep for a long period of time. If you slept for a long period of time and you're very rested, then you tend to be very energetic the next day. And of course, I know people out there will immediately say, oh, well, if I sleep too long, then I'm groggy the next day. Of course there are exceptions, but in general, sleep and wakefulness are in homeostatic balance. Thirst and water consumption are in homeostatic balance. If you don't drink any fluids for a while, you tend to get more thirsty, you drink fluids and your thirst tends to diminish likewise with food. Likewise, with most all motivated behaviors. Well, one of the most important discoveries of the last century, was largely the work of a guy named Jaak Panksepp. No, it's not Jack it's Jaak Panksepp who really pioneered this understanding of the biology of play and relating that to the psychology of play in animals and humans. He's considered kind of luminary in the field of play, and what a great title to have, right?

If you could have a title and be a scientific luminary, you might as well be the, the play guy. In fact he was known and I'll get into this later as to why, but he was known as the "Rat Tickler" because he tickled rats. And he actually found that rodents and animals of many kind generate laughter in response to tickling. And in fact, they don't have the capacity to tickle themselves something we'll also talk about why that is. And he was called the "Rat tickler," but then he discovered that many species of animals engage in laughter in response to tickling and they tickle each other. And the reason you don't hear them laughing, no you can't hear your dog laughing that isn't laughing it's something else is that most animals besides humans laugh at kind of ultrasonic levels of auditory output. Meaning the frequencies of sound are just too high for you to hear, but with the appropriate devices, he was able with his colleagues to isolate this so-called the "Rat Laughter" and then turns out there's kitten laughter and there's puppy laughter. And of course there's human laughter. So Jaak Panksepp was a very interesting and pioneering person in this field. And he also discovered that play is homeostatically regulated. Meaning if animals including children are restricted from playing for a certain amount of time, they will play more when given the opportunity in the same way that if I food restrict you for a long period of time, you'll eat more when you are finally allowed to eat. Now this is important because it moves this thing that we call play from the dimension of higher order functions or things evolved recently, you know, that are really kind of at the front edge of human evolution, deeper into the circuitry of the brain, whereby we say the brain stem, the kind of ancient parts of the brain are going to be involved. And in fact, that's the case as we're going to learn later in the podcast, play is generated through the connectivity of many brain areas. But one of the key brain areas is an area called PAG Periaqueductal Gray. The Periaqueductal Gray is a brain stem area. So it's pretty far back as the brain kind of transitions into the spinal cord. And it's rich with neurons that make endogenous opioids. So these are not the kinds of opioids that are causing the opioid crisis. These are neurons that you and I all have that release endogenous, meaning self-made or biologically made opioids. They go by names like enkephalin and things of that sort. Play evokes small amounts of opioid release into the system. They kind of dope you up a little bit, not so much as one would see if one were to take exogenous opioids. And in fact exogenous opioids as we now know, are potentially very hazardous, highly high addiction potential high overdose potential. They cause all sorts of problems. Yes there are clinical uses for them, but they're causing a lot of problems nowadays, but these endogenous opioids are released in children and adults anytime

we engage in play. And that turns out to be a very important chemical state because there's something about having an abundance of these endogenous opioids released into the brain that allows other areas of the brain, like the prefrontal cortex, the area of the front that's responsible for what we call executive function. Executive function is the ability to make predictions, to assess contingencies. Like if I do this, then that happens. If I do that, then that happens. Well prefrontal cortex is often seen as a kind of rigid executive of the whole brain. That's one way to view it, but probably a better way to view it is that the prefrontal cortex works in concert with these other are more primitive circuitries. And when the periaqueductal gray releases these endogenous opioids during play, the prefrontal cortex, doesn't get stupid. It actually gets smarter. It develops the ability to take on different roles and explore different contingencies. And we're going to talk about role play later in different contexts. And what we will find is that so much of play is really about exploring things in a way that feels safe enough to explore, right? This is not what happens when we drive down the street or when we bike down the street, when we are headed to work, commuting on our bicycle or walking or driving, we tend to be very linear and we tend to be very goal directed. We're not going to just take a new street just because we're not going to be spontaneously riding in the middle of the road and then on the sidewalk and then back and forth. Although I can remember as a kid, I was doing some of that. I like to jump off curb cuts when I was a kid. And then eventually I graduated, sorry to the cyclist, but I graduated to skateboarding. And then I look on skateboarding. You're always kind of exploring terrain, but you know, as I got older, actually I find myself becoming much more linear. I just don't play with my commute very much. It's really just about getting to work and then working. When endogenous opioids are in our system, when we're in this mode of play, the prefrontal cortex starts seeing and exploring many more possibilities of how we interact with our environment, with others and the roles that we can assume for ourselves. And so we're going to dissect one by one, the different aspects of play, role play, social play, individual play, imaginary play, competitive play they are enormous number of dimensions of play. And by the end of this episode, we are going to arrive at a very key feature. The key feature is one that's called your personal play identity. All of us have what we call a personal play identity. This personal play identity was laid down during development. And it is the identity that you assume in playful scenarios. And it is identity that you adopt in non playful scenarios. Now the great news is that your personal play identity is plastic throughout your entire lifespan. You can adjust your personal play identity in ways that

will benefit you in work in relationships and your overall level of happiness. We will discuss protocols and ways to do that. But I do want to give a nod to the late Jack, Jaak excuse me, Jaak Panksepp, "The rat tickler." And I also want to just give a nod to play generally, as we move forward in the discussion. What I'd love for everyone to do is to stop thinking about play as just a child activity, not just a sport related activity, but really as an exploration in contingencies. Again, it's an exploration of, if I do A, what happens? If I do B, what happens? If someone else takes on behavior or attitude C what am I going to do? And play is really where we can expand our catalog of potential outcomes, and it can be enormously enriching. And indeed as we'll talk about the tinkerers of the world, the true creatives, the people that building incredible technologies and art, and also that just have incredibly rich, emotional and intellectual and social lives all have a strong element of play. And so today I hope to convince you of some protocols that will allow you to expand

00:23:53 Childhood Play & Mindsets

your various roles in life, through the portal of play. So we establish that play is homeostatic, meaning we all need to do it. Many of us, including myself, haven't played that much as adults. We're all pretty busy. Number of us are stressed. We got a lot to do in life, but as children, most all of us engage in a lot of play. And in looking at the way that very young children and especially toddlers play, we can learn a lot because it reveals the fundamental rules by which the toddler brain interacts with the world. Now, one of the key things about the baby brain is that the baby brain somehow knows that it can't do everything in the world, right? If a baby needs something, it generally will cry or make some sort of vocalization or some sort of facial expression or combination of those. And the caretaker, whoever that may be will provide it. This is an ancient hard wired mechanism whereby the so-called autonomic nervous system that generates stress will create this kind of whining and discomfort, maybe arriving, maybe the baby gets kind of red in the face and the caretaker delivers some thing based on a good guess of what that baby needs. So maybe it's breast milk, maybe it's bottle milk. Maybe it's a diaper change. Maybe it's to be warmed up if the baby is cold, maybe it's to be cooled down if the baby's too warm, maybe if the baby's in its a little onesie thing, it's feeling restricted and it just wants to move and they'll get taken out of their, their crib or their stroller, whatever it is and allowed to stretch out on the floor. Remember the baby

doesn't know exactly what it needs. It only knows the state of discomfort. And of course we don't know exactly what babies and toddlers are thinking because they can't express themselves with language yet. But what's key to understand is the rule or the contingency that is set up in that scenario. In that scenario, the child feels some discomfort expresses that discomfort verbally or through a facial expression or both and then some force some person from the outside world resolves it. And so the very young baby and indeed many children up to certain ages and let's confess many adults are not able to meet or adjust their internal states of stress. And so they look to things outside of them. That's the first rule, the fundamental rule that we all learn when we come into life, that when in a state of discomfort to look outside our immediate biology, beyond the confines of our skin and find a solution, a sip of water for adults, it might be sip of alcohol, right? Probably not the best tool to relieve stress, but that's one that many people do. In fact engaging for the baby that's hungry. The bottle milk comes from the outside. As we gain more proficiency in moving through life and we can get things for ourselves. We still often bring things from the external world in to resolve this what I'm calling autonomic discomfort or autonomic dysregulation. That's not a game, but that's a rule. As we advance from infant to toddler, we start to think more in terms of where we are and what we own relative to what's out there in the world. And now in the world of child psychology, there's a somewhat famous poem that was written by a research child psychologist. His name was Burton White, and he wrote a poem called "The Toddlers Creed" "The Toddlers Creed" defines well, what the rules and contingencies of play are in very young children. And it reveals to us just how narrow and limited their world view is and how self entered their world is. So "The Toddlers Creed" read quickly, cuz' I don't want to take up too much time with this is. "If I want it. It's mine. If I give it to you and change my mind later, it's mine." For anyone that's played with a toddler, you can imagine this in your mind. "If I can take it away from you, it's mine. If I had a little while ago, it's mine. If we are building something together, all the pieces are mine. If it looks just like mine, it's mine. If it's mine, it will never belong to anyone else, no matter what." And of course, as we hear this sounds quite awful, right? And yet this is actually a reflection of what a healthy toddler would think about the world. That the objects and things, and even the people in the world are theirs, that they are actually possessions that belong to them. Now of course, some people never actually transition beyond this stage of moral and social development. And there are indeed some adults that fit "The Toddlers Creed." And you're welcome to share this with them. If ever you think that it

might be of benefit to their self-reflection. But in all seriousness Burton White's "Toddlers Creed" is really grounded in this transition from when we are infants. And we have to have things delivered to us, to the point where we are toddlers and we can access things in the world, but we tend to assume that they are all ours. And then the next stage is the really key stage as it relates to play because is in the next stage of development is where young children start to interact with other children and there's an exchange and a possession and then a letting go of certain things, learning that not everything is yours and that the entire world is not about you is one of the key contingencies that is established during play. It's one of the key way in which children go from being very self-centered and basically unable to engage with other kids for very long, without some sort of eruption of crying and some sort of battle of, you know,

#### 00:29:21 Contingency Testing

kind of push pull over an object to things like sharing and things like cooperative play. So as we transition from forms of play that are all about the self that are all me, me, me, me, "The Toddlers Creed" to forms of play that involve some discomfort in assuming roles that maybe we don't want and not getting what we want. It's really an opportunity for the brain to start to explore different roles that people take, how they work as individuals and as pairs and in larger groups. And to do that in a low stakes environment, right? You wouldn't want this to be worked out on the battlefield or when searching for food or in some high stakes environment where the survival of the species was important. It appears that these circuitry for play evolved. So that rules and contingencies around who's most important, whether or not the group is important, whether or not individuals are going to be leaders or followers, et cetera, that can be explored in a low stakes environment. Now there are hundreds of different types of play and hundreds of different types of contingency testing. But the key theme here is that play allows children and adults for that matter to explore different outcomes in a kind of low stakes environment. If you're playing a board game or a card game, you might get really into that game, but unless there's a lot of money on the table, so to speak, or you're really playing for something important or unless your ego is swollen way out of proportion, to reality, if you lose, you might not feel good about it, but it's truly not the end of the world. And if you win, you might feel really good about it, but you're not really incredible. You were just incredible in that particular situation for that particular moment, it doesn't really transform

the rest of your life, unless that game is of a particular type for sport for instance. We'll talk about sport later. So the key theme here is that play is contingency testing. play is contingency testing under conditions where the stakes are sufficiently low, that individuals should feel comfortable assuming different roles, even roles that they're not entirely comfortable within their outside life. And that all relates again to the release of these endogenous opioids, in this brain center periaqueductal gray and the way that it allows the prefrontal cortex in a very direct way I mean, truly it allows it in a biological way to expand the number of operations that it can run, and start thinking about, oh, well, okay. Normally I'm kind of a loner and I like to read and work and you know, hang out alone maybe and play alone but you know okay, I'll play a board game or a game of tennis where I have a partner and we're going to play as partners against two other people. Okay, that's a little uncomfortable, but I'll do it. And in doing that, you discover certain ways in which you are proficient in certain ways, in which you are less proficient, you discover that the other person actually tends to cheat a little bit or the other person is extremely rigid about the rules, or maybe it is extremely rigid about the way they organize their pieces on the board, or they're crossing the line into your side of the tennis court. There are all sorts of things that we learn

00:32:17 The (Power of) Playful Mindset

in these rather low stake scenarios. That's the key theme here. So before I continue, I just want to point to a tool that anyone can use, but in particular, the less playful of the group. And I would put myself into this category. Again, I'm not somebody who really engages in spontaneous play. I enjoy sports. I enjoy exercise, but that is distinct from play because the sports and exercise that I engage in, I take pretty seriously. They're not low stakes for me. I put actually I put a lot of importance on them. Which is I'm saying all this, I probably should put a little less importance on them and have a little more fun with those. And yet what I'm about to tell you is that anyone and everyone can benefit from engaging in a bit more of this playful mindset, the playful mindset is not necessarily about smiling and jumping around or being silly. That's not it at all. It's not Tigger character from "Winnie the Pooh" necessarily. It could be, but it's really about allowing yourself to expand the number of outcomes that you're willing to entertain and to think about how you relate to those different outcomes. So what this means is putting yourself into scenarios where you might not be the top performer, right? Playing a game that

you're not really that good at. I had this experience recently, friends that like to play cards, they like to do some low stake gambling. This is non illegal gambling ring. They play for trivial things. And I generally don't buy into the game. I generally don't play mostly because they end up winning and taking whatever it is that I have. But in the mode of assuming a more playful spirit, the idea would be well, if the stakes are low enough, then to play simply for the sake of playing, because there's something to learn there about the other people in the group and about one's self and how one reacts to things like someone who's clearly trying to take everybody's money or somebody who is clearly trying to cheat or somebody who's clearly very, very rigid about every last detail, including how the cards are dealt and shuffled right? There is learning in this exploration. And that is at a biological level, the prefrontal Cortex, starting to entertain different possibilities, starting to entertain different outcomes in this low stakes way. And if you think about it, that's not something that we allow ourselves to do very often. Even if we listen to new forms of music or we go see new art or new movies, those are new experiences, but that's not us making new predictions about what's going to happen next. It's not the brain working to figure out new possibilities. And so you can immediately see how just a small increase in your willingness to put yourself into conditions where you don't understand all the rules perhaps, or you're not super proficient at something, but you enter it because it is low stakes. And because there is information to learn about yourself and others could start to open up these prefrontal cortex circuits. And when I say open up, I don't mean that literally there's an opening in your skull. What I mean is that your prefrontal cortex can work in very rigid ways. Meaning if A then B, if I go down this street turn left and go that way to work, it is fast. If I go down the other street, it's slow. If there's a traffic jam there, I'm going to go there but it's starting to explore different possibilities. And there are very, very few opportunities in life to explore contingencies in this low stakes way, such that it engages neuroplasticity, the prefrontal cortex. So play is powerful at making your prefrontal cortex more plastic, more able to change in response to experience, but not just during the period of play, but in all scenarios, because you get one prefrontal cortex, you don't get a prefrontal cortex just for play. You get a prefrontal cortex that engages in everything. So going forward, I will layer on some more concrete aspects of tools, but for now, if you're somebody that doesn't consider yourself, particularly playful consider, and maybe even engage in just a little bit of play in some way, that is of discomfort to you



## 00:36:13 Body Postures

with the understanding that is increasing your prefrontal cortical plasticity. Another really interesting and important aspect of play is so-called play postures. These are seen in animals, and these are seen in humans. And for those of you that are watching this podcast on YouTube, I'll do my best to adopt them here. For those of you that are listening, you'll just have to imagine them in your mind's eye, but Jaak Panksepp and indeed Darwin himself, study these play postures that all animals engage in. Perhaps the most familiar one is seen in dogs and in wolves where they will lower their head to the ground and they'll put their paws out in front of them and they will make eye contact with another typically dog or wolf to so-called call the play. Now, when they do this posture, it's obvious that they're lowering themselves. They're not in an aggressive stance, because they're lowering their head. And this is universally known among canines as play posture. There's some famous videos online. You can look these up of dogs actually doing this with bears that they're confronted with and the bears, at least in these videos in exchange also lowering their head, and there you see bear dog playful interactions. Now you always have to be cautious with bears in general. I would say you have to be cautious with bears, but this speaks to the universality of this bowing, this sort of the, the, what some people call the puppy bow or the play bow that dogs do turns out that humans do this as well. Although in a different form, I'm sure there are some that go into the, the down-dog play posture, but more typically when humans want to play, they will do a subtle or not so subtle head tilt. The head tilt with eyes open is considered the universal head and facial expression posture of play in humans. So when two people see one another, if they are aggressive towards one another, they will assume certain facial expressions and postures. But if they're feeling playful towards one another, oftentimes they'll tip their head to the side just a little bit and they'll open their eyes. They might even raise their eyebrows briefly. This has been seen again and again and again. Another hardwired feature of so-called play postures is what's called soft eyes. When animals are aggressive, or when they're sad, they tend to reduce the size of their eye openings by basically making their eyelids closer together, somewhat, by keeping their eyes together in particular for aggression, they'll bring their eyes towards what we call a vergence eye movement. Bring it towards the center that actually narrows the aperture of the visual field. When people or animals want to engage in play, they tend to open their eyelids somewhat, and they tend to purse their lips just a little bit. So it's not like

stronger pursing when your lips like this, it's, pursing their lips. They'll open their eyes a little bit. And they'll often do the head tilt as well. Sometimes with a little bit of a smile. These are reflexive these are not trained up. Children do this. Adults do this dogs, wolves do this. Even certain birds will do this. Most birds have eyes on the side of their heads, but they do a sort of form of this soft eyes approach. And certainly in raptors, you see a softening of the eyes and indeed raptors like Hawks and Eagles they actually do have a certain form of play, but only early in life. The other thing that we see during play, or what are called partial postures, partial postures are a kind of play enactment of postures that would otherwise be threatening. So a partial posture that we see during play in animals and humans that relates to aggressive play. So things like wrestling or things like rough and tumble play, which is very common in animals and kids and some adults. Is that because there's going to be physical interaction in animals, what will happen is they will march toward one another often very slowly, but rather than having their hair up, which is we call piloerection, which is when the hair goes up, animals do this to make themselves look bigger. Think of about the, the cat. That's trying to look bigger or an animal that's being aggressive, trying to look bigger in the presence of a foe, a different animal that they're either going to try and kill or fight in some way, even if it's to defend themselves, partial postures occur when animals will approach one another, but they'll keep their fur down. Humans will do this to, they will approach during play, but unless it's highly competitive play like a football game or a boxing match, they will actually shrink their body size somewhat. We have hair on our bodies, some of us more than others, and that hair is capable of piloerection. It can stand up. That's the hair standing up on end phenomenon, but most of us don't have enough hair on our bodies that we can actually use that to make ourselves larger. So what you see with people who are about to engage in play is they tend to make their body a little bit smaller unless they are highly competitive and highly competitive play is its own distinct form of play. That we'll talk about later, such as during sport, when the stakes are high, a Super Bowl football game, I'm revealing my ignorance about sports here. The Super Bowl as it's typically called is a very high stakes game, right? Salaries depend on it. Sponsorships depend on it. It's on television, reputations depend on it. So that's not really playing a game. That's playing a very high stakes game and there you're not going to see these partial postures. You're not going to see soft eyes and tilting of the head. At least not between the opposing players on the team, you're going to see quite the opposite. Grunting, screaming, shouldering people not blinking lowering their eyes, or rather

shrinking their eyes down to be, to appear more aggressive. These kinds of things staring right through the other person, you know verbal threats et cetera. So that's not really play, even though we say they're playing a game of football, it's very high stakes play. What I'm referring to here is when it's fairly low stakes. And we see this again in animals and human. So there are many, many of these partial postures. Again, they happen spontaneously. So if someone ever looks at you and they tilt their head a little bit and they raise their eyebrows and they maybe smile a little bit, they're looking at you playfully, that's the universal human exchange of, I want to play. Do you want to play? There's another play expression that is considered the most extreme of the come on let's play express and postures. And this is one that's seen in a lot of primates and indeed in some humans as well. And that's the eyes wide open and believe it or not tongue out, it's the, that kind of silly thing. That's I don't think that I've ever done that before. Just that kind of thing is basically what primate species of all kinds. And indeed we are old world primates as well, do when they want to say, I'm definitely here to play and that's why I'm here. Okay it's it has this kind of silly look or connotation. But if you watch chimpanzees or you look at Bonobos, or even in the so-called new world monkeys, which tend to be the smaller monkeys, old world monkeys tend to be the ones that in general, see the world as we do, they have what we call trichromacy. They're the ones that often can look very human-like. The new world monkeys tend to be the little ones in general I'll give you a little trick here. Little tool based on primatology. If you see a monkey and it's making very slow movements, or you see an ape of any kinds, making very slow movements, very likely to be an old world primate. If you see a monkey and it's, it can very quick movements like it's doing this kind of thing, like it's like a could be a squirrel monkey could be a marmoset, likely to be a new world monkey. And they don't see the world that the same way we do, they see the world more like a dog. They don't really see reds. They see reds as orange et cetera. Okay that's not a hard and fast rule. And I'm sure the primatologists are going to come after me with whatever primatologists come after you with monkey biscuits or something like that. But in general, it's a good rule. If you're at the zoo and you see a slow moving monkey with slow deliberate gestures kind of moves its eyes makes eye contact every once in a while, those tend to be the old world primates, those kind of jittery ones that look like they're really nervous wrapping their tail and kind of hiding there in a little bundle. Those tend to be the new world monkeys, okay.

## 00:44:03 Rule Testing & Breaking

Again, not a black and white type division, but that'll get you most of the way. So the whole purpose of these partial postures or the tongue out thing is to limit power in deliberate ways to really take bodily expressions that could be portrayed or could be interpreted as aggressive or as threatening or as wanting to mate, or as willing wanting to do anything for that matter. And to limit the power with which they are expressed in very deliberate way. So that's the putting the hair down, despite getting into a fighting stance. That's saying let's fight, but I'm not really here to fight fight. It's low stakes fighting. Like if I pin you, then I'll let you go. Or if you pin me, then you ought let me go. And so immediately you can start to see how play starts to call into action, social dynamics in which both parties have to make some sort of agreement about how high the stakes are. Now, the failures to do this are also very informative in how we develop in social groups. And this also can inform why some people really play well with others and other people don't. And some people seem to get along well with groups and can handle other people. And some people are very rigid. In fact, I have an anecdote about this when I was a kid, we used to play this game. It's not a game I suggest, but we used to do what were called "Dirt Clod Wars." So a friend of mine, his parents were generally not home in the afternoon. So we must have been somewhere around 10 or 11 years old. And we would set up these two big dirt mounds. We would shovel them to big dirt mounds on two sides of the yard. And then we would just take dirt clods and we throw them at one another and just have dirt clod wars. Again, not suggesting this I'm not responsible for what happens if you do, but there were rules and the rules were, for instance, you couldn't pack rocks into the dirt clods and you could run across to the other side and you could jump on the other person's mound and you could throw dirt clods in there. I guess, as the stuff that we thought was entertaining. But if someone got hit in the head, generally there was an unspoken rule that you kind of stop and see whether or not they were damaged or not before you'd continue, you couldn't continue pelting them. And of course, people broke this rule. In fact I remember one kid I'm not going to name him because actually he's grown into a very actually prominent and functional adult, but he got hit once in the head. And then I think someone had thrown a dirt clod shortly thereafter, and all of a sudden he just went into a rage, picking up rocks and sticks and attacking another kid. And so clearly that was a case in which the rules of the game were now being violated, but it served a very important purpose. There was, you know,

the typical thing that the, there were some tears I think, as I recall from one kid or the other, there was like snot coming out of the nose and turning bright red, a kid went home. It was a mess. The parents had to say something, or maybe there was a phone call. I don't quite recall how it got resolved. But the idea is that there's an agreed upon set of rules about how high the stakes are and what we're all going to do. And this is separate from sport where there are clearly defined rules about what's out of bounds. What's in-bounds. What sorts of behaviors will get you a yellow card or a red card for instance on the soccer field, all animals including humans are doing this low stakes contingency testing and all animals including humans you'll find, start to up the stakes. And inevitably in group play, one member of the group will kind of break rules. You see this also in puppies. So for instance, puppies will bite one another with those sharp little needle-like puppy teeth. I remember when Costello had those teeth, those things were so darn sharp and puppies will yelp when one of their littermates bites them, that Yelp actually serves a very important inhibitory function. This is well defined to tell the other one that's too tough, and this is how animals learn soft bite. Okay. If they don't get that feedback from other littermates, they never actually learn. What's too hard and what's soft. And so humans do this as well. Now you can look at your adult, counterparts, and indeed we should probably look at ourselves and ask, you know did we learn proper play contingency when we were younger? Do we tend to take things too seriously? Do we tend to overreact aggressively when other people are clearly engaging in, you know, playful, jabbing or sarcasm or things of that sort. So each of you will have a different experience of this, but the point is that play serves many functions, it's not just about the self. It's also about interactions between multiple people. It's about rule testing and low stakes contingency rule breaking also serves an important role

#### 00:48:24 Role Play

as is with the example of the "Dirt Clod War" puppies biting other puppies et cetera. And last but not least, there are different forms of play that help us establish who we will become as adults. One of the more powerful of these is role play when children and sometimes adults will take on different roles that are distinct from their natural world roles in order to for instance, establish hierarchies. So someone's going to be the leader and someone's going to be the follower. Someone will be dominant. Someone will be submissive. Someone will work alone. Other people will work in a group. These kinds of

role playing are again ways in which the prefrontal cortex has to expand the number of operations in neuroscience we call these algorithms that it has to run in order to make predictions. You have to take in a lot of information about your environment all the time and make predictions. But if you are suddenly cast into a new role, well then you definitely have to make even more predictions from a different standpoint. So these are very powerful for teaching the brain, how to function. I had a sister growing up, I still have a sister, fortunately, and she and her friends largely played with dolls and doll houses in the room next door. And they take on different roles. In fact, some kids, if they play alone will start to take on the role of leader by taking on an imaginary or creating an imaginary friend. And, you know, my apologies to my sibling, but for a long time, she had an imaginary friend eventually that imaginary friend disappeared. I don't know the science around imaginary friends and what it makes them disappear or not at what stage of development, but imaginary friends are pretty common. And that's just another way of being able to, you know boss somebody around, if that's your thing, or to do engage in cooperative play. So we can look at this stage of development, we call childhood and we can look at each stage of it and we can say, wow, there are all these different dimensions of play that really are about testing out how we feel comfortable or uncomfortable, how we react good or bad, how we react with stress or with glee when others behave in certain ways. And so what I'm hoping is coming through is that play is not just about having fun. Play is about testing. It's about experimenting and it's about expanding your brain's capacity.

#### 00:50:39 Neurobiology of Low-stakes Play

And that's through early in development, and it's through throughout the lifespan. So at this point in the discussion, I want to take a step back, look at the biology and neurochemistry of play just a little bit. And that really define what is effective play. If the goal of play is to explore different contingencies in low stakes environments and to expand the function of our prefrontal cortex so that we can see new possibilities and new ways of being become more flexible, more creative, more effective outside of the games of play or the arenas of play, I should say. Well then we should be asking, how do I know if I'm playing? How do I know if I'm playing correctly? Turns out there's an answer to that. Earlier I referred to this brain area, the periaqueductal gray that releases opioids, endogenous opioids into our brain and body, and tends to relax us a bit. It actually is

what leads to these things like soft eyes and head tilts and puppies making, you know, puppy postures and things of that sort, and how that opens up the number of different functions or algorithms that the prefrontal cortex can run, but there's another piece of the puzzle, which is for something to genuinely be play and playful, and for it to have this effect of expanding our brain and engaging neuroplasticity of really changing our brain so that we can see and engaging more possible behaviors and thoughts et cetera. We also have to have low amounts of adrenaline, so called epinephrine in our brain in body. Now the background science for this is quite extensive, but for those of you that are interested in papers and manuscripts, perhaps the best one is a review published in *Neuroscience and Biobehavioral Reviews* by the very Jaak Panksepp although he has a co-author, which is Stephen Siviy, S I V I Y I'll provide a link to this in the caption show notes. And the title of this paper is; "In Search of the Neurobiological Substrates for Social Playfulness in Mammalian Brains." And it's a quite extensive review, but it basically boils down to some key findings whereby, any sorts of drugs or behaviors or scenarios that increase levels of adrenaline too much, will tend to inhibit play and drugs and scenarios and I'm not suggesting recreational drugs here, but these were experiments that were done in the laboratory setting that increase the endogenous opioid output will tend to increase playfulness. And so really the state of mind that one needs to adopt when playing is, first of all you have to engage in the play it, whatever it happens to be with some degree of focus and seriousness and focus and seriousness in the neurobiological context generally means epinephrine being able to focus is largely reliant on things like adrenaline epinephrine, but also the presence of dopamine, which is a molecule that generates motivation and focus in concert with epinephrine, but also that these endogenous opioids be liberated. And it's really the low stakes feature of play that allows those endogenous opioids to be liberated. What do I mean by that? Well, if you are very, very concerned about the outcome, like you've put a lot of money on the table in a given game, or you're a football player in the Super Bowl, or you're playing a game for which, you know, defeating the other person or your team winning is absolutely crucial to you. Well then that's not really going to who engage the play circuitry. On the contrary, if you are engaging in those same behaviors or any other behavior in a way that you're simply there to explore, but you don't have high levels of adrenaline in your system,

00:54:22 Expanding Capabilities through Tinkering

you're not stressed about the potential outcome. Well, then that constitutes play. Now that's somewhat obvious on the one hand that you take seriously what you take seriously, and you can be more playful about things that you don't take so seriously, but what is absolutely not obvious is that the state of playfulness is actually what allows you to perform best because the state of playfulness offers you the opportunity to engage in novel types of behaviors and interactions that you would not otherwise be able to access if you are so focused on the outcome. Okay. So a state of playfulness is absolutely critical, not just during play, but during competitive scenarios of any kind. I actually started to cultivate a practice related to this. When I was in college, I had this kind of general practice of when I wanted to learn something. I would tell myself that it was the most important information in the world and that I was very very interested in it. I would kind of lie to myself and say oh, I'm super interested in, I won't name the topics, but super interested in this or super interested in that. And I could sort of delude myself into being hyper focused on whatever it is that I was learning in ways that surprised me. However, when we are hyper focused on something and we are rigidly attached to the outcome, we can't engage in flexible thinking. So it's a great tool to be hyper-focused on something and take it very, very seriously when we're simply trying to learn things by kind of rote memory, learn things and regurgitate, learn and regurgitate of the sort that, you know, I'm frankly a lot of schooling involves. But if we are trying to get better at something, we sort of hit a wall in athletic performance or in cognitive performance, where we're not creative enough, where we're finding let's just use a sports example that, you know we only have a certain number of moves that we can deploy or certain number of swings of the racket that we can deploy. The way to actually expand your practice is to engage in this kind of low stakes thinking, the idea that, well, I'm just going to kind of play and tinker. I'm going to explore in a way that it doesn't really matter if the ball goes back over the net, doesn't really matter if the ball goes in the hole and it's counterintuitive because you think, no, the thing that we need to do is drill and drill and drill and drill. And indeed there's a place for that. But this mode of play with modest levels of endogenous opioids being released in our system, plus low levels of adrenaline, right? Epinephrine low levels of epinephrine and adrenaline are possible only when the stakes are low enough that we're not stressed. Well that combination really allows the prefrontal cortex to explore different possibilities in ways that can truly expand our capabilities over time. Now, this has been seen again and again, also in the



business sector, some of the more challenging, or I should say compare additive companies to get jobs at are very interested in hiring people that as children were so called tinkerers, and actually NASA was first famous for this, that many of the people that achieved great success in engineering at NASA, when they looked back into their childhood histories, those people tended to be tinkerers. They were people that would kind of play with things in way that wasn't about rigidly following a recipe or an instruction manual. Great cooks discover new forms of food. Indeed created entire genres of food by way of being tinkerers. Okay, musicians do this. I grew up playing various sports, but skateboarding was one that I was particularly involved in for a long time. One of the greatest skateboarders of all time is some of you may recognize his name as the Great Rodney Mullen. And Rodney was kind of famous for evolving the sport and continuing to evolve the sport in ways that no one could predict using skateboards and all sorts of ways that no one had thought of previously. And of course there are other skateboarders that did that as well, but he's particularly well known for that. And his process is his own. I can't speak to it too much, but he was also known as a kind of a tinker as somebody who would spend a lot of time, just kind of flipping the board and just flipping it into the air and watching the ways in which it flipped and kind of studying the physics of it really and expanding on his existing understanding of what could happen on a skateboard by way of just playing. Now, he took it very seriously, but it's this kind of razor's edge between taking something very seriously, but also tinkering and playing and exploring and just seeing what happens and kind of like, well, let's just see what happens if we did this, that mindset is extremely powerful to export from this thing that we call play into what we could call more serious endeavor of one's occupation or sport, whether or not it's behind a desk or whether or not it's running around on a field really for or engineering, any endeavor. And so the whole purpose of this episode on play is yes on the one hand to illustrate the incredible evolutionary utility of play for setting up the self and relation of the self to others, indeed for setting up cultures entirely, cuz' cultures will watch sport together or they'll celebrate their team winning. I mean, World Cup, I've never been a big soccer fan, even though my dad is Argentine, but it's incredible. I mean the entire world kind of lights up and gets engaged around whether or not their team, their country is going to win the Olympics also being another example, but play and sport are not quite the same as I've pointed out before. And for all of us who are thinking about tools and things that we can extract from science to enrich our lives, I would say for those of you that are already playing on a regular basis in one form or another terrific

start to expand other forms of play in particular forms of play that involve new groups of individuals. So if you're somebody that typically plays one-on-one with somebody, try to expand into playing as teams. If you're somebody who only plays alone, then try to expand into playing in perhaps one-on-one first and in groups,

01:00:03 Play Is THE Portal to Neuroplasticity

this is the way that your brain learns and evolves and changes and gets better. And I raised this because another one of the top 10 questions I get is how can I keep my brain young? How can I continue to learn? How can I get better in school and sport in life and relationships, et cetera, emotionally, cognitively, and on and on and on. And yes, there are supplements that can support neuroplasticity. Yes, there are brain games and apps that can support neuroplasticity. But if you really want to engage neuroplasticity at any age, what you need to do is return to the same sorts of practices and tools that your nervous system naturally used throughout development. And it evolved over hundreds of thousands of years to trigger this thing that we call neuroplasticity. And the reason this is so important is because it starts to move us away from what some people call hacks. I define hacks as using one thing for a different purpose to kind of get a shortcut. I don't really like the term, frankly, and I don't like it because it's not grounded in any biological mechanism. But when we look at play, we can say, play is the portal to plastic. Play at every stage of life is the way in which we learned the rules for that stage of life. And play is the way in which we were able to test how we might function in the real world context. So play is powerful. And we could even say that play is the most powerful portal to plasticity. The reason for that is that yes, this high opioid, low epinephrine or adrenaline state is what opens up play. But then inside of the arena of play, when the prefrontal cortex is running all these different possibilities in this low stakes way. But with some degree of focus, there are a number of other chemicals that are deployed. Things like Brain-derived neurotrophic factor and other growth factors that actually trigger the rewiring of brain circuits that allow for it to expand. And indeed that's what is neuroplasticity. If you're interested in those chemicals and kind of arena of things that happen when one engages in neuroplasticity, there's a vast literature out there. But one of the more popular books that I think is quite good is from my friend and colleague, John Ratey, who's a psychiatrist at Harvard Medical School. That's R A T E Y. He wrote the book "Spark" a few years back, and I think it's still very relevant. And John talks

about the important role that play exerts in the neuroplasticity process and points to a number of different protocols that one can engage in. He also points to the importance of navigating new environments to not just go on the same hike every week, or take the same walk, but actually get into new novel environments. So you're starting to sense a theme here. There's novelty, exploring contingencies, keeping the stakes relatively low, et cetera, et cetera. But these really are the gates to this holy grail that we call neuroplasticity. Neuroplasticity as I've talked about in the podcast before is a two step process. It involves focusing very intensely or at least focusing somewhat on whatever it is that one is trying to learn, and then engaging in deep rest, ideally deep sleep in the following nights. And I've also talked about the benefits of things like naps and Yoga Nidra so-called NSDR, Non Sleep Deep Rest for enhancing or accelerating plasticity. You can check out the episodes on Focus at [hubermanlab.com](http://hubermanlab.com) or the episodes on How to Learn Faster. The detail all of those. We had a newsletter that lists out all the tools for neuroplasticity enhancing neuroplasticity, all that is available. Zero cost to you at [hubermanlab.com](http://hubermanlab.com), et cetera. You can just download that information, but John's book that newsletter those episodes. They really point to this two step process where it's focus and then rest focus and then rest and play is its own unique form of focus and then rest, focus and rest. It's not the same as learning something for sake of school or critically trying to learn a motor behavior for sake of sport. It's really about expanding the number of things that you could learn down the line. Okay, so said once again. So I just want to make sure it's abundantly clear play is about establishing a broader framework within which you can learn new things. It's not about learning some specific thing. It's not about the game you happen to be playing. It's not about the dollhouse that the kids are playing with so that they can become amazing dollhouse players when they grow up. Right. The dirt Clod war that I referred to earlier for better or for worse was not about becoming the best dirt clod thrower or winning the trophy for dirt clods in the neighborhood. Although we actually had a trophy for the best dirt clod team. Alas, it was not my team that year. But the point is that you're learning rules

01:04:44 Adulthood Play

and establishing a broader foundation of practices that then can learn more things within that context. Thus far I've tried to convince you through a combination of data and anecdote and explanation that adopting a stance of playfulness and indeed engaging in

play on a somewhat regular basis could be beneficial to you regardless of circumstances or goals. If I haven't done that already, what I'm about to tell you, hopefully will push you over the line. It turns out that when you look across the kingdom of all animals, what you find is that animals that engage in playful behaviors for the longest period of time are also the animals that have the greatest degree of neuroplasticity, the brain and nervous system's ability to change in response to experience, put differently, animals that only play for a very small fraction of their entire life have very rigid brains that don't learn new things, whereas animals that play for a long period throughout their life have very plastic brains. And there's even some evidence that's at this point, largely anecdotal, but there's some data starting to emerge that adults that maintain a playful stance that engage in things again that are low stakes contingency exploring important enough that people focus and that people pay attention to what they're doing, but that they are not, you know, filled with adrenaline, you know, freaked out about the outcome being A or B, they're not super, super competitive, maybe just a little bit competitive or not competitive at all. That allows for more ongoing plasticity. And one of the people that comes to mind in thinking about this is of course the Physicist, and I should say the Great Physicist, Richard Feynman, Nobel Prize Winner Professor at Caltech was involved in the Manhattan Project, but was also known for being a lifelong tinker, right? He also is a mischievous tinker. If you read any of the books about Feynman or by Feynman "Surely You're Joking." Mr. Feynman, or "What Do You Care What Other People Think?" these are wonderful short stories, mostly about Feynman, doing things like picking all the locks at the Los Alamos Laboratory and putting all the top secret documents out on the floor of the office so that when people came men in the morning, they were all out there. Obviously they weren't released to the general public. He didn't want to threaten national security, but playing pranks like that. And actually Caltech, I don't know if this is still the case, but Caltech where he was employed was always known for doing very technologically challenging pranks. They're not known for their athletic pros at Caltech, sorry, Caltech, but they were known for example, disrupting the scoreboard at the Rose Bowl in Pasadena, for instance, and things of that sort through technological feats, at least at the time required a lot of playfulness and technological pros. So if you look in science or you look in art, or you look in medicine or you in any domain, what you find is the people that continue to evolve new practices tend to be people that were tinkerers. People that are very creative, tend to be people that are unafraid of exploring things in a, this low stakes way. They're not so rigidly attached to the outcome that they have to do

everything perfectly all the time. Now they might cloak these playful behaviors so that their final works always look perfect or always look incredible, but they have this kind of playful nature about them. I would venture even say that the, the street artist Banksy, for instance, obviously an incredible artist puts a ton of thought and preparation into their work, but there's a kind of playfulness to the whole thing too, of using two dimensional paintings in concert with three dimensional city dwellings in ways that, you know I think that most people hadn't previously, there were other people like Christo and, you know, artists of that sort that did that. But I think Banksy is kind of recognized as the modern, the modern rendition of that kind of playfulness using cities in ways that most people don't use cities using art in ways that most people don't use art, for instance. So to go back to the example of Feynman. Feynman was somebody who learned to paint and draw quite well into his sixties. He was somewhat famous or infamous, I should say for Bongo Drumming on the roof of Caltech. I say infamous because he was known also for doing that naked. Something that certainly not in concert with the ethical standards and behaviors of universities today. But Feynman had this playful spirit as a child. He had that playful spirit as a teenager, and he had that playful spirit as an adult. And that's one of the whole hallmarks of Feynman was that he wasn't just a rigid physicist who could explain things clearly to the general public. He always carried through this playful spirit and in some of his writings, he pointed to the fact that that playful spirit was something that he worked very hard to continue to cultivate in himself because it was the way in which he could see the world differently and to indeed make great discoveries in the field of physics, but also to kind of evolve his relationship to life more generally. And so he comes to mind as a prominent example of somebody who did this. And if I could achieve anything with this episode, besides teaching you something about the biology of play, it would be to teach you about the utility of play. Again, I'm, don't consider myself a particularly playful person by nature, but I've tried over the years to adopt this stance of exploring things that are, you know, very focused on contingencies of different kinds, but keep the stakes low enough

01:10:14 Fire Together, Wire Together

that I can have some fun doing them. And I like to think that it's benefited me somewhat. Now, I'd like to drill a little bit further into this thing that we called neuroplasticity. Again neuroplasticity is the brain and nervous system's ability to change in response to

experience. And I should just say that throughout the entire lifespan, the nervous system can change very quickly in response to negative experiences. We can almost all engage in what's called one trial learning where if something really terrible or traumatic happens to us, our nervous system will rewire almost immediately, at least within a few days, such that we tend to want to avoid the experience that led to that trauma. Now the whole business of why people return to things that are traumatic to them is a whole other issue. There are books about things like trauma bonding. There's the so-called repetition compulsion from psychoanalysis that people go back into trauma to retest and gain new opportunities to overcome the trauma, et cetera, et cetera. But in general, what I'm referring to here is, you know, you have a bad experience at the swimming pool when you're a kid where someone holds your head underwater too long, and then you just don't want to get back in the water. That's one trial learning of sorts, that of course can be overcome through proper exposure therapy or someone that you trust taking you there, or any number of behaviors that allow you to overcome that, be that particular scenario and experience something new in that same context. But across the lifespan, the learning of new things, new contingencies, new possibilities occurs very differently from about age zero when we're born until about age 25 and thereafter. So from about, about, I want to emphasize approximately age 25 onward neuroplasticity occurs through the process that is exactly as I described before, focus, rest, focus, rest, we focus very intensely. We can't do the thing. We can't do the new movement. We can't do the golf swing. We can't learn the math. We try, we try, we try, we try, we sleep a few nights. And then all of a sudden we can do it, right, because the rewiring actually occurs during deep rest or naps, but mostly during deep sleep. From birth till about out age 25 however, we can learn things, new things, and new contingencies, not just negative things and traumatic things through somewhat passive exposure to those things, right. I will never forget the first time that we went on a family trip to Washington DC. And we went to the Smithsonian. I got to see the, the old fighter planes. And I think, I think the Kitty Hawk or the first one of the first planes was there. Anyway, I obviously my recollection isn't terrific. My hippocampus is, is flailing on that one, but I'll never forget the trip. And I'll never forget who went. And I think I was probably eight or nine years old. It's embedded somewhere in my memory. And so just through passive experience and my focusing on the things that excited me about that trip, I have a recollection of that experience. I didn't have to deliberately focus. I didn't, wasn't telling myself focused, you're going to need to remember this trip someday and you're going to be podcasting

about this, you know, in 39 years, or whenever again, I forget exactly how old I was. But the key feature here is that the developing brain is able to learn through passive experience because the neurons, the nerve cells in the developing brain are much more over-connected than they will be later in life. The way to think about this is sort of, if you use Google maps, as I do too often I think when I drive, there are a number of roads and pathways that would get you from point A to point B. We could imagine those as neural circuits, or we could imagine neural circuits as those roads. Early in development, the nerve connections are much more extensive. It's like having a Google maps that where everything is connected to everything through tiny little cross streets. And the whole thing is just a complete mess. But then by taking particular routes of behavior of thought of emotion, certain routes become well established. And the other routes that are not taken simply disappear. Now in the biological context in the brain, we call that process pruning. And the simple way to envision this is early in development. You have many, many more neurons than you will have as an adult. Those neurons are extensively interconnected, and approximately 40% of those interconnections will disappear by the time you're 25 years old, they are gone. They are actively removed through processes that involve things like glial cells that come in and literally sneak their little processes in between neurons at the synapse, which are the points of contact and communication between neurons and push those apart, even eat neurons, right? There's some incredible work from for instance, Beth Stevens' Lab at Harvard Medical School, showing that glial cells go in and eat synapses that are not functional for that particular circuit. Now, what this tells us is that much of our learning during development is the removal of incorrect connections, but it also involves the strengthening of connections that are going to serve certain emotions, certain functions, motor functions, cognitive functions, et cetera. The process of play is largely a process of engaging pruning of neural connections and strengthening of the remaining connections. I'm sure that many of you have heard the term fire together wire together. That phrase is often incorrectly attributed to the great Donald Hebb, who indeed was great. Did incredible work a psychologist from Canada who established a lot of the basic cellular learning rules for learning and memory, but it was the also great Dr. Carla Shatz, who is now at Stanford and was at Berkeley and Harvard as well, but who is at Stanford Medical School who coined this term fire together wire together. Indeed that's what happens when children play when adolescents play and when young adults play, whether or not it's social play or play with an object, whether or not it's a sport or a play of any kind imaginary play

imaginary friend play, there is a strengthening of certain neural connections and a pruning away of up to 40%, perhaps even more of connections that are not necessary for certain types of behaviors, emotions, and thoughts. And what this means is that it is through the process of play, that we become who we are as adults. And as I mentioned earlier, it is through the process of play that we are able to adjust who we are as adults. Now, there are bounds on this process, as far as I know there's never been a reported case of an individual who had a hyperplastic or I should say a brain that was as plastic in adulthood as it was in childhood. But what this tells us is that what we do in the process of play as children is really how we set up the rules for how we behave as adults in almost all domains, which is really incredible. And of course the reassuring thing is that playing as an adult will allow you to expand on those neural circuits. You can literally grow new connections. Some of you may be saying, does it create new neurons for better or for worse? It does not seem that many new neurons are added to your brain in adulthood. There are some papers that report a few neurons in certain brain areas, isolated brain areas, but by and large, most of the rewiring of neural connections is the removal of certain connections. This process we're calling Pruning and the strengthening of the remaining connections that make those kind of Google maps roads. And the analogy I laid out before thicker and more robust think about as taking little trails and turning them into roads, then paving those roads. Then turning those roads into highways, then putting up more lanes on those highways and eliminating all the small little back-country roads that one could take. And again,

#### 01:18:03 Trauma & Play Deficits & Recovery

this is an analogy for what is happening at the level of neuro circuitry. Now, one of the key findings that has emerged from the literature is children that have been subjected to trauma or immense amounts of stress of any kind, have a harder time both engaging in play, but also a harder time accessing neuroplasticity later in life. The good news is this is not a permanent effect. And we'll talk about some of the ways to overcome that in a moment, but this should make sense to you because earlier we talked about how a high level of adrenaline epinephrine in the brain and body actually inhibits blocks the circuits in the brain and body that generate play behavior. And when I say that, I mean that in a very concrete way, that epinephrine and adrenaline can actually suppress the sorts of circuitry that can lead to things like soft eyes or tongue out, or the head tilt, or what we



called partial postures of being able to engage in, you know, a rough and tumble play, but not take that to the point of outright aggression and damaging the other person or them damaging you. So when I say that, you know, trauma and stress can inhibit neuroplasticity by way of inhibiting play at a deeper neuro biological level. What I'm really saying is that the high levels of adrenaline that are generated from trauma and stress actually shut down the circuits that allow a child or a young adult to enter the game of play or in the game of play in the same way that a child or young adult who didn't have high levels of adrenaline in their system could possibly engage in. Now, the good news is that many of the existing trauma therapies that are out there now, including things like EMDR Exposure Therapy, Cognitive Behavioral therapy, and on and on, including some of the therapies that are more neurochemical, things like ketamine, or are more engineering based, things like Transcranial magnetic stimulation for instance, many of those are paired with forms of talk therapy that are really about the same thing that play is about, which is exploring different contingencies. It's about exploring different types of emotional experiences as they relate to the same sort of scenario that created the trauma. And we did an entire episode on fear and trauma, and I recommend you check out that episode. It's easy to find again at [hubermanlab.com](http://hubermanlab.com), it's on YouTube, Apples, Spotify, et cetera, et cetera, very easy to find. And there I talk all about trauma treatments and the various kinds of trauma treatments that are out there, their efficacy in different scenarios and traumas and so on. But the point I'd like to make now is that the reason why children who experience a lot of trauma and stress have limited plasticity later on is because the neurochemical substrates that are created from trauma and stress, because after all stress is epinephrine and epinephrine is stress. Those are inseparable and the way in which it more or less shuts down or at least inhibits suppresses those play circuits. And again the reassuring thing is that by engaging in play as adults, we can reactivate some of those circuits and reopen the plasticity. In fact one very prominent trauma treatment now, especially for people that have been subjected to very severe traumas, in the ongoing sense, meaning traumas that went on for many, many years is to get them to engage in play in things like dance in basically getting them to engage their bodily movements in ways that they would otherwise not feel comfortable to engage in. And I find this area so interesting because on the face of it, you could say, oh, that's kind of, you know, is that really biomedical treatment? You know, you're taking people who traumatized and having them dance. I mean, it seems kind of silly on the one hand, depending on your, you know, your particular orientation.

But on the other hand, it's actually quite profound and quite grounded in the mechanisms by which the brain circuits change. So again, back to this original principle, which is that play, isn't just one portal to plasticity play is the fundamental portal to plasticity and that play and dance and exploration of novel movements, exploration of novel athletic movements are the route by which we access new ways of thinking new contingencies. And I find it wonderful that the trauma release and the psychiatric and psychology community are exploring things like play and dance and other forms of reopening these circuits because indeed we would all love for there to be a magic pill by which trauma could be erased and new memories could be laid down or a device that could do that. But frankly, if you ask me or a number of my colleagues, whether or not that's likely to happen anytime soon in an effective way, I think the short answer is going to be no, that there are going to be chemicals and things that can augment and support that process, but that there's not going to be just a magic pill that will suddenly reverse trauma altogether. That it's always going to be a case whereby shifts in neurochemical states are going to have to be combined with new ways of thinking and new behaviors. And I find it wonderful in reassuring that people are looking at play and play behavior as a not just one tiny shard of possibility there, but that it might actually be the main driver

#### 01:23:25 Competition & Dynamic Movement

and a highly productive lever by which to rewire the traumatized brain. So if you're like me, you might be thinking, okay, I'm willing to be more playful. I'm willing to explore, play as a portal to plasticity. And that all makes good sense, but what should I play? What should I do? Well, we've already established that you want to keep your adrenaline low. You have to keep the stakes slow enough that you're not going to get totally consumed by the outcome. Now, for some people who are highly competitive, that's going to be challenging. And yet I don't want to make it seem as if you can't be competitive during play. There are many forms of competitive play that because you are a competitive person, allow you to derive great joy from that competitive play. I have a friend who's particularly good at horseshoes. I'm not particularly good at horseshoes, but whenever we play horseshoes, I can tell he's out there to crush me on horseshoes. And it's just one of these things where, you know, I can tell he derives great pleasure from crushing me at a game of horseshoes. I can't say because I haven't actually done the microdialysis, which is a way of extracting chemistry from the brain in real time, nor have

I recorded from his brain or image it in a scanner, whether or not he has high levels of epinephrine or low levels of epinephrine. During those games of horseshoes, I suspect his low levels of epinephrine and high levels of dopamine, especially when he wins. And he has, he wins every time. But the win is that you can be competitive during play, provided that you were enjoying yourself. Okay, you can be competitive provided that you were enjoying yourself. There are particular forms of play that lend themselves best to neuroplasticity. And those particular forms of play again, are not designed to necessarily just engage the plasticity that allows you to perform that behavior, but rather to expand the number of possibilities for your brain to change in general throughout life and the two major forms of those for which there's good Peer Reviewed Research is to engage in novel forms of movement, including different speeds of movement. So let's say for instance, you're somebody who runs. I happen to like running. I try and run three times a week. And generally when I run, I run forward, I don't run backward, although recently, because I've become very excited about the work of so-called "Knees Over Toes Guy," his name is Ben Parker, but he goes by "Knees Over Toes Guy" on Instagram. I've never met him, but we've exchanged a few messages back and forth. And some of his practices involve walking backwards or doing sled poles backwards. I found these to be very beneficial for my back and for my, you know, interior tibialis and some things that have really helped with my posture and so forth. But in general, when I run, I run forward, I don't tend to run backward that much. And I might do that for a few minutes at the end, but not so much throughout the entire run. Running doesn't lend itself to a lot of novel forms of movement, lateral movements. So for the nerds out there movement in the Sagittal plane or angled movements, but it does appear that things like dance or sports where you end up generating a lot of dynamic movements where there's jumping, where there's movement at different angles, where there's ducking, where there's leaping, that basically involve a lot of dynamic movement. And aren't just strictly linear. Those seem to open the portals for plasticity. And that's because they mimic a lot of the brain circuitry that is associated with play. And the reason for that is the way in which those dynamic movements and movements of different speeds engage the vestibular system. The balance system, the vestibular system is in the inner ear, relates to the cerebellum, which translates the mini brain. You got a little mini brain in the back of your brain. It brings together visual information in a very direct way. I talked a lot about this in the episode on how to learn faster. So if you want to go in depth on how vestibular and different types of motor movements can open plasticity, I talk a little bit more, I

should say a lot more there, but suffice to say that engaging in play that has a lot of dynamic movement or movements of different speeds, things like dance, things like sports, like soccer where you're moving in different dimensions. That tends to be very conducive to what we would call play related circuitry

01:27:36 Chess, Mental Roles, Novelty

provided you don't take it too seriously. You don't get those high levels of epinephrine. Now for those of you that are also interested in non-physical or non-athletic forms of play that can really expand plasticity. There's some very interesting research about the game of Chess. I don't play the game of Chess. I've played a few times. I confess I don't know how to move all the pieces. So I'm not going to try and describe that here, but I've always wanted to learn Chess. And I think after reading some of the Peer Reviewed Research about chess and play and neuroplasticity, now I understand why there's a really nice paper published in the International Journal of Research in Education and Science in 2017. And the title of this paper is, "Is Chess Just a Game or Is It a Mirror That Reflects a Child's Inner World?" That's a very, a very intense title for a biologist like me, but this paper is so interesting because what it really points to is the fact that in a single game chess, you have at least as I understand two players, and those two players are moving pieces on the chess board, for which each piece can do different things, right? Can move in different ways under different scenarios, but they're different rules for different pieces. And so each player actually has to assume multiple identities during the same game. And each of those identities has different rules and ways of interacting. So in a way we can think of chess as one game, but actually chess is a kind of a substrate for exploring multiple roles for different characters. And this is quite a bit different than for instance, video games where somebody has their favorite video game player, or they have an avatar. And they're always in the same role. It's also quite a bit different for when you engage in any kind of play where you are yourself, you're just being you in that game. And so now I'm highly incentivized to explore chess. You see quotes out there, for instance, things like "Chess is life or jiu jitsu is life." I always assumed that that meant that someone's entire life was chess or their entire life was jiu jitsu for instance, but in reading over the research about chess in particular, but at also certain forms of martial arts, also certain forms of dance. What one finds is that indeed those games are life in the sense that they involve adopting multiple roles and exploring contingencies in a

number of different ways. So there are some games that allow you to explore a much vaster landscape of movements or of mental roles or of ways of engaging in strategic movement as is the case with chess. And so when you hear that, you know, activity blank is life. It often reflects the passion for that activity, but I think looked at differently. It also reflects the fact that that activity is a portal through which you can explore life through many, many different lenses. And I think that that's especially powerful in terms of thinking about how play can be leveraged for plasticity. So for those of you that are interested in leveraging play for neuroplasticity and expanding your mind, if you will, I highly recommend picking an activity that will allow you to adopt different roles within that activity where it's not rigidly linear. This is actually a way in which I start to depart from this modern and important, but somewhat narrow idea. That exercise is the only route to plasticity. Yes, it's true. I have Nobel Prize winning colleagues that swim for two miles a day and have done on that for a long time. And they will tell you, I always think more clearly after my swimming and I certainly in my experience after a good run or a good workout, my mind seems to work best. Unless of course, that workout was very, very intense. I've talked about this before. If you do work out very, very hard in whether or not it's aerobic or resistance training or sport of any kind, your brain won't function as well afterwards, mostly because of the diversion of oxygen to tissues away from your brain, you actually are getting less oxygen to your brain, but in general, most of us feel that if we exercise regularly, our brain functions better. But there are activities that extend beyond linear exercise, beyond just generating the same sets of movements over and over again, when or not it's exercise or not. And that's really what play is. Play is about dynamically exploring different kinds of movements, dynamically exploring different kinds of thoughts, dynamically exploring different kinds of roles that one could adopt. And that is the way that the brain learns new things. So I encourage you to explore chess. I intend to learn chess this year. I'm very excited to do that. Now, if you already play chess and you are an expert chess player, you actually will derive less benefit in terms of this play induced neuroplasticity than you would, for instance, if you went out, and I don't know, played a game of soccer or did something that was very novel for your nervous system, because in that novelty and in that exploration of new behaviors and new ways of thinking, you are opening the portal to plasticity, whereas in doing what you already know how to do and trying just to perform better and better at it, you will get better at chess, but again, that's just chess. You are not expanding the realms in which you can become more plastic, that you are able to learn new things

## 01:32:52 Personal Play Identity

in relationship, in life, in finance and friendship, et cetera. In researching this episode, one of the most interesting areas I discovered was this notion of personal play identity, personal play identity is a term that at least to my knowledge was coined by a Turkish researcher by the name. And forgive me, I'm going to mispronounce this is Gökhan Güneş G O K H A N, last name G U N E S. And forgive me Gökhan and if we have any Turkish speaking members of the audience, please put the correction in the comment section on YouTube, make it fanatic so I can understand what it is. Please I'd love to correct it and apologies, or who knows if I got it right then it was pure luck. Gökhan Güneş has coined this term personal play identity, and the key role that personal play identity establishes in who we see ourselves as being, and not just in the context of play. Personal play identity has four well defined dimensions. And I should say that if you're interested in learning more about this, the paper that I found particularly informative is published in Current Psychology and the title is "Personal play identity and the fundamental elements in its development process." And the author of course, is Gökhan Güneş G U N E S last name. This is from 2021. So recent review. There are four components to personal play identity, how you play, your personality, socio culture and environment. So that's the third one that's together, socio culture environment, and economics and technology. Now that sounds somewhat complex, and this paper is somewhat complex, but basically what it says is that we bring together certain aspects of ourselves and how we react to different place scenarios when we're younger. And we bring that forward into the world. In all context as adults. To illustrate this, I'm going to ask you a question, when you were a child, let's say 10 years old, would you have considered yourself competitive? Would you have considered yourself somebody who's cooperative? And realize of course that those are not mutually exclusive, you could be competitive and cooperative. Would you consider yourself somebody that preferred to play alone or preferred to play with one or two close friends? Or were you somebody that really enjoyed playing in large groups? Here's a key one. Were you somebody that enjoyed playing the leader in one moment and was equally okay with being a follower at a later moment? Were you okay with having your role switched midway through a game? Were you get up upset or be delighted or not care at all about having to switch teams during the middle of game because your team was winning right? To even things

out, you can imagine how that would play out internally. You would immediately register that you must be a valuable player because you're being moved off the winning team toward the losing team. But then again, you're now being forced to join the losing team. How did you feel about that? Were you somebody that was comfortable with other people breaking rules or perhaps even yourself breaking rules or bending rules, kind of be able to find term, or were you somebody that really needed to know all the rules? And if everyone didn't rigidly adhere to those rules was quite disturbed by that? The number of questions goes on and on and on. And I will provide a link to a paper that asks a number of questions that helps you arrive at a sort of score of sorts or an index of what Güneş and others have referred to as personal play identity. The point is that if we look back to our early adolescence, somewhere between 10 and 14 years old, a peak time for social development, a peak time for play of various kinds, a peak time for motor development, a peak time of psychosocial development, where we learn where we fit into hierarchies. As we relate to members of the same sex of the opposite sex, et cetera, we can start to get a portal into how and why we show up to various activities in work and relationship, et cetera, as adults. In fact, I'll venture to say that if we go into that process for ourselves for five or 10 minutes, you start to see some remarkable parallels

#### 01:37:24 Play Transforms Your Future Self

between the way you were at that stage and your tendencies and your preferences as adults. We tend to look at our early childhood experiences and our families, and to some degree our friends in terms of how we become who we become. I've talked about the incredible work of Allan Schore on previous episodes of the podcast. Allan Schore is a psychiatrist and has done extensive work on how parent child interactions in particular baby and mother, but also baby and father shaped the brain and the brain and emotional system's ability to go from states of elation and excitement, the so-called dopamine epinephrine type circuitry to the more warm soothing types of calm interactions that in broad terms could be described as more serotonin oxytocin and things of that sort. That work really points to the key roles that the caregiver and the child you engaged in an early life. And that is incredible work. I do hope to host Dr. Schore on the podcast at some point in the not too distant future, but equally important of course, are the interactions that we export from that early laying down of biological circuitry and psychological circuitry, to the way we play by ourselves and the way we play with others

in small numbers or in great numbers. And of course it would be the case that how we played as a 10 or 12 year old would impact how we behave as a 16 year old and as a 20 year old and as a 30 year old and so on and so on. One of my favorite things about developmental biology and developmental psychology is that it is grounded in the fact that we don't just have a childhood and an adulthood. There isn't just our child self and our adult self. And even though there are transitions around the mechanisms that underline neuroplasticity at approximately age 25, it is simply the case that development is our entire lifespan, that our lifespan is one long developmental arc. How long depends on our genetics, our lifestyle accidents, injury and disease of course, but it is one long developmental arc. And so it shouldn't surprise us at all that how we learn to play as a 10 year old or 12 year old would impact how we play and interact with people as a teenager and a young adult and on and on and on. And that play is the place in which we explore in which we learn play is the substrate by which our nervous system changes us from this hyper-connected batch of neurons, where everything is connected to everything, more or less to a brain and nervous system whereby certain circuits work with immense proficiency and others are less accessible to us. But again, the wonderful thing about the human nervous system is that because it is plastic for the entire lifespan and because these two elements of focus and rest can be deployed again and again, and again, just because neural circuits didn't form does not mean that they can't form later in life. And today we've been focusing on how play itself, the same substrate that we use during development to become who we are, is the portal by which we can change who we are for the better. So I hope I've convinced you that play is an extremely important fundamental homeostatically regulated aspect of our nervous system, which is just a mouthful of nerd speak to say,

#### 01:40:55 Recommendations for Play

play can change your brain for the better. And that is true for every stage of life. The recommendation that I make, and certainly the one that I'm going to direct it myself as well is to try and engage in at least one hour of pure play per week. Now I came to that recommendation because of the literature that says, well, you need to engage something pretty repetitively. It should be novel. So this wouldn't be something that you are exceptionally good at already. If you insist on doing something that you're already exceptionally good at, then you want to really do some free form, low stakes tinkering.



So make it safe, but make it free form. So really explore things with that. Some people call this beginner's mind. Although I find that a little abstract, I like the notion of beginner's mind, but sort of like, how do you know if you're in beginner's mind? I think beginner's mind is sort of the expectation that you're not going to do it well yet, but play extends beyond beginner's mind. Play is really about not even worrying if you're going to get good at it or really proficient at it. It's really about exploring contingencies with truly low stakes. That's what will allow you to access these neurochemical combinations of elevated endogenous opioids, low epinephrine, et cetera, that will open up neuroplasticity. For those of you that need a little more guidance on how to play. There's a book out there actually learned about this from Tim Ferriss' blog, it's called "Play It Away: A Workaholic's Cure for Anxiety." So that's more focused on anxiety. The author is Charlie Hoehn, last name H O E H N will provide a link for it in the show notes and caption, "Play It Away: A Workaholic's Cure for Anxiety." But books and other resources aside, I think one hour of play per week is a reasonable amount of time to engage in dedicated play behavior. For the purpose of opening up these neural circuits for plasticity, the key feature of course, is to not have immense proficiency in that given activity, or at least not the way you perform it. And if you do gain proficiency in that activity, well, then it becomes something else it's no longer about play it's performance. So in that case, you would then want to adopt a new play behavior. You'll notice that I largely avoided using the word fun throughout this episode. Fun is a somewhat abstract term and like many emotions and many verbal descriptions of experience. It falls short in the context of a neurobiologic goal discussion about play. If you have fun, terrific. Some people might find, however that engaging in play is kind of uncomfortable. Well there, your goal then should be to lower your level of discomfort by focusing less on the outcomes and just simply engaging in the behavior because, well, I'm telling you that it's good for you, but hopefully you will tell yourself that it's good for you and that you will experience that it's good for you. The literature certainly points to that. And the literature certainly points to the fact that play is the way that we are built. We are built to play. We have brain circuits from back to front and within our body that are there for play and they don't disappear. They do not get pruned away as we go from development to adulthood. So if ever you needed a neurobiological explanation for why play is important throughout the lifespan, it's that. It's that biology does not waste resources. It's a extremely efficient. And were the circuits for play not to be important in adulthood. They would've been pruned away, but I guarantee you, they are there in your brain and nervous system now,

they will be there tomorrow

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