Announcer: Bulletproof Radio, a state of high performance.

Dave: You're listening to Bulletproof Radio with Dave Asprey. Today's cool fact of the day is that, believe it or not, it's normal for your mind to wander in a study done at Harvard and Dartmouth, and the University of Aberdeen in Scotland, researchers used MRI and they found that brain regions capable of task, unrelated thought, in other words, daydreaming or mind-wandering, are almost constantly active when the brain's at rest or performing a task that doesn't require concentration. And another study published in 2013 in Psychological Science suggests that mind-wandering might be a sign of high capacity working memory. In other words, your ability to think about more than one thing at the same time. And if you've read Head Strong and even The Bulletproof Diet, one of the ideas there is that you have these active mode networks in the brain when you're consciously doing something and these passive mode networks and, well, it turns out the passive mode network's always on to a certain extent.

And today's interview is going to obviously have something to do with this fact, because it turns out having your mind wander has some valuable things and there are people researching that. And that's why today's guest is Jonathan Schooler, PHD, Professor of Psychology and Brain Sciences at UC Santa Barbara. And he's really studied mind-wandering all over the place. So this is an expert, a very, very talented expert in mindfulness, cognitive psychology, memory and consciousness. So we're going to talk about philosophy and psychology and what your brain's doing when you don't know what it's doing. Jonathan, welcome to the show.

Jonathan: Thank you, Dave. Nice to be here.

Dave: All right. I first came across your work because one of those websites, qz.com published something about how our obsession with productivity is making it harder to solve simple problems. And it was kind of a summary of your research. And in the article they quoted you as saying, "Our research found that mind-wandering may foster a particular kind of productivity. And that's, in order to have an “a-ha” moment, you kind of have to do nothing." How do you know that you have to do nothing to have an “a-ha” moment?

Jonathan: Well, I wouldn't say that you, that that's the only way to have an “a-ha” moment. But what we found is we had creative individuals, creative writers and creative physicists. Every day we reached out to them and asked them if they had a creative idea that day, and the situation under which they had that idea. And then we also asked them some characteristics of the idea. Was it an “a-ha” moment? Did it involve overcoming an impasse? And so on. And what we found is that about 80% of the ideas they had, they were either at work or actively pursuing the problem. But about 20% of the time, they were neither at work nor actively pursuing the problem. They were just doing something unrelated. And the idea occurred to them during this, what we call a task, independent mind-wandering situation. And in that situation they were more likely to have an “a-ha” experience and more likely to overcome an impasse. So what this suggests is that these situations where you're not actively at work, you're not trying to solve a problem, are uniquely suited for a particular kind of insight, insights that involve overcoming impasses.

Dave: That's where 80% of the time you're thinking really hard to get it, and the other 20% of the time you're doing something else.

Jonathan: Taking a shower. Yeah.

Dave: Okay. And you chose to study the 20, not the 80. And to zoom in on that, wouldn't it be more productive to focus on the 80?

Jonathan: Well, the thing is, is that there's a lot of research that looks at when people are actually actively doing their tasks. But this issue about looking at when you're mind-wandering and it's, you know, it's really sort of remarkable that people are able to get so much done when they're not even at work. They're not even trying to get it done. So this, to us, is an especially, understudied and intriguing aspect of when people have ideas.

Dave: So basically no one was paying attention to it, and maybe there's some way to amplify this. I think most people listening have probably had that good idea in the shower and it's almost a stereotype at this point. And I also know when I'm working on maybe that most creative hard problems are, how do you name something? You know, what's a really good name? Like, Oh, I don't know, say Bulletproof? But, other things like that, even for other friends, books or companies or something, I oftentimes get those phone calls saying like, "We need the name," and a good amount of the time we're talking about it, I'm like, it's not right, it's not right. But in the middle of the conversation, perhaps because of neurofeedback or something, I'm able to stop trying to solve the problem, even just for like five seconds. And it seems like it'll just appear in my mind. But if I'm actively going, well, what's a word that you know, reminds you of snuffaluffagus or whatever it is, it's not there. And then it just magically appears.

Is that normal or how much time do we need to have in order for that “a-ha” idea, just to pop into your head?

Jonathan: It's a really good question. What people oftentimes have as an experience of a tip of the tongue where you are trying to come up with the word that you actually know. And as long as you keep trying to find it, it just refuses to come to mind. And what we find is, is that if you just let go of that idea and allow your mind to wander, that that provides the opportunity for the thought to come to mind. Now it's not a guarantee, so you can't say exactly how long it will take. But it seems that the active effort to try to pursue these things when you've got a tip of the tongue impasse is actually counterproductive.

Dave: I used to have dozens of tip of the tongue moments where I just couldn't come up with the right word or something that I knew, but I didn't know to the point that it was just a major fact of life. And after I started taking Nootropics, changed my diet, and most specifically removed toxins from food and things that are inflammatory, and things like that, I've gotten to the point where I don't fish for words, I don't drop words. It's exceptionally rare. And it's to the point where if it happens, it stands out like a red flag. Like Dave, you did something wrong. And I'm bringing this up because earlier this morning I couldn't come up with words four times in a row, when I was interviewing a candidate for a job at Bulletproof, and I actually stopped doing the interviewing and I

said "I did something wrong because I haven't had a brain that performs this poorly in so long."

And I diagnosed what I think it was, it was probably eating an incredibly excessive amount of rosemary and oregano, like a cup of each one in a pizza-like thing that I made last night. So I think I might've just overdone it on the volatile organics. But a very long lead into a question which is, is searching for a word a function of poor metabolic activity or a not so functioning brain? It happens early in senile cognitive dementia, it happens pre-Alzheimer's, or is this just a normal thing that is now abnormal for me? I'm personalizing this, but for everyone listening, how often is healthy?

Jonathan: Tip of the tongues are very common, and people really should not be too concerned about them. It's just part of daily life. A lot of times what you can just do is choose another word. So when you find that particular word not coming to mind, just find the next best word. And that's oftentimes the best solution. So I guess you could cut down on the oregano, or you might just find a different word that does the same purpose.

Dave: Are there any pharmaceuticals that will get rid of that problem?

Jonathan: I have to tell you, I'm personally a little bit skeptical about your solution, but I'm a very big believer in placebos. Placebos are an incredibly powerful and understudied effect. So when you believe in something, it has tremendous, tremendous powers. So if you found a diet that you believe will help you to cut down on your tip of the tongues, it will work if for no other reason than the placebo.

Dave: At the last Bulletproof, or now the Upgrade Labs Biohacking Conference, we had a guy named Robbie Richmond who's doing clinical trials on placebos. Or he actually has pills, called the X pill, and it says on the bottle "placebo", and you actually write on the bottle what you want it to do, and you take it. And they get results, in line with what you'd expect, you know, 30 something percent placebo. So there's definitely something there.

However, it feels like when I'm still doing my diet, sometimes this happens. So I'm not sure that the correlations are entirely predictable. In fact, I kind of scratch my head, because it's maybe twice a month when I'll drop one word. And this is a very marked change, but it happened over the course of years. So maybe it's a placebo, in which case I'm going to keep doing it, but yeah.

Jonathan: Yeah. I think people should find healthy placebos and stick by them.

Dave: What about things like, and I know you're not a psychopharmacologist or anything like that, but it's very hard to say something like Modafinil or caffeine or nicotine are placebo effects. I mean, I can blindfold somebody and give him one of those things. And there are studies for all three of those things around working memory and things like that where they actually functionally do improve it, at least in some studies. And anything that's your favorite for making mind-wandering more efficient, more effective or focusing like that?

Jonathan: Yeah, well it is the case that there are certain drugs that do enhance concentration. I also find ginseng, and it may just be a placebo also, but I believe in it.

Dave: There's good studies, yeah.

Jonathan: It works well for me. But this thing that we find to be the most effective technique for helping with mind-wandering and focus is mindfulness, is meditation. Establishing a practice of finding five or ten minutes a day to focus on your breath or some other object of grounding and just breathe, and try to keep the thoughts on that focus, whatever it is. And then when you catch your mind-wandering, as you inevitably will, you just gently bring your thoughts back to the breath. And, what we have found in a number of studies, is that this very simple technique can be quite powerful, not only in reducing mind-wandering, but in enhancing performance. So for example, in one study, we found that people who engaged in a two week mindfulness course, improved their performance on a working memory task and on a GRE reading tasks quite substantially. And the benefit was specifically associated with reduction in mind-wandering.

Dave: No, you can't double blind a study like that. How do you know it wasn't all placebo?

Jonathan: Well, we also had a nutrition course as the alternative, and as you've demonstrated, people have very strong beliefs in the value of nutrition and they seem to find this other course very compelling and were sort of equally aligned with its potentials as well. So you can never be sure that there isn't some element of this, which is a belief. But we did have an act, what's known as an active control, that people believed in that did not produce the same effects.

Dave: Oh, so you compared the mindfulness program with the act of control was a non-mindfulness program essentially?

Jonathan: That's correct.

Dave: [inaudible 00:12:11] would have the same results?

Jonathan: That's right.

Dave: Okay, got it. So it was basically comparing nutrition, but you are probably feeding them garbage nutrition, at least if it came from the UCSB nutrition department. Sorry guys.

Jonathan: I don't know if we told them to hold back on rosemary and oregano.

Dave: No, no, I, those are actually good for you. But when you get like, 50 times the amount you're supposed to, it's probably not good for you.

Jonathan: Well, fair enough. And I do think we, we definitely weren't trying to introduce like the best possible nutrition program. This was just sort of the very basics of understanding sort of how to eat a balanced diet, and so on. Although they did keep a nutrition journal and did a variety of things that are considered to be healthy.

Dave: Okay, you want them to be mindful about their food at a minimum. And that didn't do it. The mindfulness about breath did. And I would say that's not because of placebo. That's because mindfulness about breath has been discovered independently on every continent by almost every long lived culture out there. There's probably something to it, because it wouldn't have spontaneously emerged in all of those places and all of the different ways it has if it wasn't a basic thing for humans. But I love it that you've, you know, you've shown more evidence behind it.

You've also talked about how you think it's possible that there's some unconscious processes that happen during mind-wandering. Do you have any inkling, even if it isn't proven yet in a study, about what those unconscious processes are, like what's going on in there?

Jonathan: There's a number of possibilities. I think that the mind is this associated network. There are all these different types of associations that are connecting, and we see this during dreams where we have all these sort of wild connections that come to mind. And the idea is that when people are mind-wandering, it's basically sort of stirring the pot and allowing these unconscious associations to reorganize and consolidate, and allowing new things to come to mind. Perhaps in a very similar way to how dream states have been shown to allow for consolidation and facilitate the reorganization of conceptual ideas.

Dave: I love it that you just led into what I wanted to say next because you've also talked about how you can experience a sleep deficit, but you could also experience a mind-wandering deficit, which is a really profound statement. So I mean, there are people right now listening to this podcast, they probably feel every minute of their lives when they're not focused on something, filling it up with Bulletproof Radio, or music or even a phone call. Like let's say like there's no reason that your brain can't be engaged all the time when you're awake, audio books and things like that. What happens if you have a mind-wandering deficit?

Jonathan: Well, we need to do more research on this topic. But what we find is that if individuals are given a non-demanding task to engage in where they are not really required to devote a lot of thinking to that, first off, not surprisingly, they're more likely to mind wander. But, more surprisingly, what we find is that under those circumstances, they show a greater benefit of incubation. So for example, in one study we had people try to come up with as many uses as they could come up with for various items such as a hanger or a brick. And then, in one condition, we gave them a non-demanding task to work on. In another condition, we gave them a demanding task, and in a third condition, we didn't give them any break at all. And in a final condition, we just had them sit there doing absolutely nothing.

And what we found is that when they engage in the non-demanding tasks, that was the most beneficial in terms of providing an incubation interval that allowed them to come up with the most additional creative solutions when we gave them a second opportunity to come up with these. So, it seems that by engaging in these, non-demanding situations, maybe taking a shower, gardening, that this is the kind of opportunity that allows the mind to wander in this way that facilitates creative incubation. Now, if you're

always engaging the mind, in such a way as to not provide the sort of idle time for mind-wandering, then you're not providing this opportunity for creative incubation.

Dave: I think I used to have an excessive problem with that, with mind-wandering when I was younger, you know, in high school and things like that. We might not call that ADHD, but I would find that under certain, particularly certain lighting conditions like fluorescent lights, I would just go into daydream, a daydreaming state, whether I wanted to or not. And years later when I opened a neuroscience institute, a training place, I actually realized that under really strong artificial light, I get a whole brain theta state, whether I want it or not. And theta is the brain state associated with these daydreams and with actual dreams, right? So it'd explain that to me, and I'd learned to ignore all that, because I couldn't function in the world without it.

But some time about 20 years ago, I read a book, and I wish I could cite its name, and it said, hey, here's a meditation practice. When you close your eyes, sit here and just watch what comes in. Just pay attention to that stuff. And I realized that I had never paid attention to what happened to my mind when it wandered. I didn't have a little process running in there saying, hey, what's going on? When I started doing that, it's like, oh my God, there's all sorts of weird stuff in here. But also some really good stuff. And I think it changed my creativity. I mean, I remember sitting in the lobby of this company called Exodus Communications, and I'm like waiting for the next meeting. I kind of like close my eyes and sit there and just massive stuff downloads into your brain. You're like, whoa, right in the middle of a workday. I'm like, do I write this down, what do I do with it? Is that mindfulness of mind-wandering a practice? Is there a name for that? Is it, or am I just weird?

Jonathan: No, well you may be weird, but that is a practice. It's known as open monitoring. And the idea is that sometimes you can use the breath as your ground, the thing that you're focusing on, and other times you just watch your thoughts, you try not to elaborate on them, you just let them pass and then watch the next one come through. And there was actually a study which compared the open monitoring to the focus, like the breath focus that I mentioned before in an incubation study. So the same sort of idea. They gave people unusual uses task, then they gave them a break, where they did either open monitoring or focused meditation, and then they gave it to them again. And the open monitoring was uniquely helpful in enabling them to come up with a new solution. So, yes, this is actually a very well established technique.

Many people find it harder to do because the problem is you tend to go down the rabbit hole, that you have a thought and you start going all the way down and you forget that you're supposed to be watching your thought and you just go down that thought. And so it can become challenging. But, so the trick is you watch your thoughts, but you try to watch the thought from a witnessing perspective. You don't think "Oh, I'm getting all involved in this thought." You just watch it, let it go, and let the next thought arise.

Dave: All right, I haven't done this on the show before. And, in fact, if it makes you mad and you're listening to this, it probably means you need to do it more. I'm going to insert a two minute quiet period right in the middle of this episode right now, and the reason for this is I want you to try open monitoring and it's okay if you're doing something else

that's really active. You might just skip the next two minutes, but I would really seriously, don't do social media. Don't do anything else. Literally two minutes of mind-wandering at the least or better yet, paying attention to your mind-wandering and the show will be back in exactly two minutes, but just notice what's going on in there when you've got no Bulletproof Radio, no iTunes, no music, no Spotify, no nothing, and just watch what it is, and see if it was worth it, because that is a unique form of meditation. I'll see you in two minutes.

Now Jonathan, what do most people experience when they start trying that open monitoring thing you just described?

Jonathan: Well as I mentioned, people do find it challenging. And so oftentimes when you first start to practice meditation, people start with the focusing on the breath, because it's a little bit more concrete. You have a very clear thing to pay attention to. But what people tend to define when they really let their thoughts, witnessing the thoughts in this way, is that they changed their relationship with their thoughts in a very powerful way. You may have seen the bumper sticker which says don't believe everything you think.

And this recognition that just because a thought came into your mind doesn't necessarily mean that you have to endorse it or believe it, is a very, very powerful insight. I think it's one of the most powerful insights that comes out from engaging in this kind of open monitoring. We recognize as you see these thoughts come that "Ah, that thought, I don't really necessarily believe that thought." And then once you take the sort of witnessing perspective, the thoughts don't have quite the same fierceness, ferocity to them that they do otherwise. Oftentimes people will have self-denigrating thoughts. They'll think mean things about themselves. And when you realize, I don't really believe that, that's just that thought that crossed my mind, it makes it much easier to release it and let the next thought come to mind and it helps people to ultimately be more at ease.

Dave: That's a pretty profound statement. And if during that last two minutes, if someone said, wow, that most of the thoughts came into my mind were, you know, negative, nasty self-talk, what's the next step for someone who has an issue with that? And I'm saying this because I had massive problems with that, that I don't have anymore. But I mean you, you've studied, you're a professor, this kind of stuff, what should someone do with like, oh my God, I just noticed I have a mean asshole living in my head? What do you do?

Jonathan: Well, first I need to admit that, you know, I've got a mean asshole in my head too. It happens all the time that I will have-

Dave: It's just a placebo. No, I'm joking.

Jonathan: Yeah. Well, that's the thing, you just have to recognize that it's just the thoughts that are going through your head. And the real trick is this switch where you switch from identifying with the speaker to identifying with the listener. And once you do that, then you can just recognize that speaker can just be an asshole sometimes. But I don't need

to endorse that. I can just let that go and move on to the next thought. So once you don't take yourself quite so seriously, it actually makes it much easier to release.

Dave: The speaker listener question sounds kind of like a Zen Buddhist sort of thing. You know, who am I, kind of a question. And my ultimate realization from a lot of that work was the mean voice that used to reside in my head just wasn't me. It was some ancient automated system. But when I stopped identifying with it, it really lost its power. Because if you walk by some crazy person on the street and they said the same thing, you'd tell them to f off or just ignore them and look the other way. But if somehow if you think it's you saying it to you, it's really painful. So I maybe disassociated myself from that, which may or may not have been a good thing. But I appreciate your explanation of speaker versus listener because it's useful. So that two-minute period made you think uncomfortable thoughts, there you go. Maybe they weren't yours.

What are some of the drawbacks of mind-wandering though, Jonathan? I mean, if it's such a good thing, we have a deficiency of it. What if you do a little too much of it.

Jonathan: Oh, there's a lot of drawbacks, and I have to tell you, it's a lot easier to demonstrate the drawbacks because they're just so many of them. One of the first places that we started looking at mind-wandering was in the context of reading. Everybody's had the experience of reading and at some point realizing that their eyes have been moving across the page, but their mind has been completely elsewhere. And not surprisingly, but importantly, if you're mind-wandering while you're reading, you're simply not extracting the information. Same thing if you're in a lecture, if you're mind-wandering during a lecture, you won't extract the information. If you're mind-wandering in a conversation, you're not going to get it. Mind-wandering has been shown to be a major source of car accidents. It is a major source of disruption when people take tests. We find that when people, even taking intelligence tests, one of the reasons they don't do well on it is they were actually mind-wandering during the test. So pretty much-

Dave: It's the lack of coffee, I mean come on.

Jonathan: Coffee can help, but the bottom line is any demanding task whatsoever, if you mind wander, you're not going to do as well on that demanding task. And since we're routinely engaging in demanding tasks, mind-wandering really can be a problem in many situations. The trick is to mind wander at opportune times, to mind wander during the non-demanding tests, to mind wander when you're standing on line, to mind wander when you're on the highway, when there's really not a lot of traffic, to mind wander while gardening. Those are the times where you get the benefit of mind-wandering without the costs.

Dave: Okay. That is an interesting perspective. So you actually can have conscious mind-wandering to improve how you perform, or you can have really poor mind-wandering that gets in your way. How do I choose the good mind-wandering versus the bad mind-wandering? What's the trick?

Jonathan: Well, this is again something that we're working on. One of the things that seems to be important is to develop what we refer to as a meta-awareness. Meta-awareness is where you, that moment where you suddenly realize that you were mind-wandering instead of paying attention to your reading. And so what you want to do is sort of develop habits of meta-awareness where you check in and discern whether or not this is a good time to be mind-wandering or whether or not this is really a time to be focusing. We think that this is one of the things that emerges from the mindfulness practices. That through practicing, watching your breath and of open monitoring, that you are refining your meta-awareness, you're refining your ability to recognize what are good times and what are bad times.

Dave: Okay, that makes sense. What's going on electrically during mind-wandering? What are your neurons doing? What are the processes in your brain that we understand?

Jonathan: Well, I mean your brain, at the level of electrical processes, you know, your brain is doing pretty much the same thing that it's always doing there. Some neurons are firing other neurons or not. But there is a set of brain, a network, known as the default mode network that you mentioned at the outset of this interview. And that network is much more active when people are mind-wandering then when they're not. Now ordinarily when people are engaged in a task that was as task positive network, the executive network. And that tends to be especially involved when you're engaged in a very demanding task. But an interesting thing about mind-wandering is that you find that both the executive network and the default mode network, which tend to be anti-correlated during mind-wandering, they actually tend to both be going on simultaneously. And this may be another reason why mind-wandering may be useful for creativity because you're sort of providing a circumstance in which two systems that tend to not co-occur are working simultaneously. And that may allow another reason that that allows sort of connections that wouldn't otherwise happen.

Dave: All right. You've also put together some five types of mind-wandering, that it's a really useful way to think about it, because I have not considered mind-wandering very much until I was prepping for this interview with you. And I recalled that story that I shared earlier. But I've never categorized my mind-wandering. So what are the five categories, and how useful are they?

Jonathan: Yeah, so there actually may be even more than five that we've been thinking about. And let me talk about the ones that are the ones that I think are the, we found to be sort of the most productive, with respect to mind-wandering. So those include engaging in meaningful thoughts, engaging in thinking about bizarre things, engaging in thinking about general things that you're interested in, and thinking about topics that you have been stumped on, or something in which you are interested in making progress.

Those four kinds we seem to find to be especially valuable. Creative individuals appear to be particularly likely to engage in those kinds of mind-wandering. In contrast, say, we have not found any value, at least with respect to creativity, about thinking about romantic relationships or sexual fantasies, don't seem to prompt much in the way of creative ideas. But what we think is, is that this constellation of different kinds of productive mind-wandering may produce sort of a general family that I like to think of

as mind wondering, which is sort of curious, playful thinking. And it seems that this curious, playful thinking, may be especially associated with creativity and especially valuable for creative discoveries.

Dave: How do you have more curious, playful thinking?

Jonathan: Well, this is a great question, and we're currently trying to encourage research to find this out. I think one thing that can be quite helpful is actually to expose yourself to interesting material which you then give yourself a opportunity to mind wonder about. So, for example, listening to Bulletproof Radio, I think is a really good idea, because what is happening is you're planting seeds of interesting ideas, and then you can reflect on those, when you mind wonder. What I would encourage people to do is, I think it's great to, there're all these opportunities for listening to really interesting sources of information. But, I think the critical thing is don't just constantly do that. You need to give yourself some time to reflect on it, to let your mind mull it over. And so by feeding your mind interesting material and then returning to that interesting material at idle moments. I think that's the way to really foster this creative mind wondering.

Dave: From a creativity perspective, as you say that, I'm putting together my creative process, because I write books that have been well received, and what I'm doing, having 600 episodes of Bulletproof Radio having conversations. Like the one we're having, Jonathan, where I get to learn cool stuff and think about things I haven't thought about. And then in my other one minute a day of spare time, it seems like I'm going to go to PubMed and read some strange paper about the psychology or neuroscience or, or cellular biology. Because I think it's neat and I'm kind of a dork.

But then when I sit down to write a book, there's some unconscious process that happens where I end up realizing the theme and the structure of the book, but then to write it down, all of that work, it comes from having spent the time, as you described, putting the interesting stuff in there. But then the crystallization of that stuff, especially in the form of writing or maybe in teaching a class, those are the two things that for me are at the height of learning. So there's crazy ideas, playful thinking to assemble the ideas, and then there's structuring the ideas.

How much of that structuring aspect of creativity is mind-wandering versus some conscious thing that happens later? And do we even know that?

Jonathan: Yeah. So I think this is a really important point. And that is that there's sort of different elements to the creative process. There's the generating of ideas, and then there is the evaluating of those ideas. And I think that, mind wondering is a very useful for the generating of ideas. But for the actual evaluating of it, there you really have to just bite the bullet and focus. That's where you really need to just let that executive network kick in, think hard about it, really try to decide, does this work? Does that not work? And, as you mentioned, writing and speaking about things is really critical for knowing what you know and what you don't know.

You may have experienced this where you might've been sort of walking in and you thought, "I got it, oh, I've got this worked out." And then you sit down and try to tell it to somebody else or try to write it down. And at that point you realize you didn't have it quite as well as you thought you did. So the creative process is a great value for incubation and for this sort of unconscious associations and for mind-wandering and mind wondering. But, end of the day you've always got to do that hard work.

Dave: And that is the hard part for most writers, including the process I go through where when I'm going to sit down for writing, I usually get going around 10:30, 11 at night, but for the 45 minutes before that I kind of putter around, I'll have some decaf, you know, I'll kind of just do a set of normal things that I would normally do. And then I finally, somehow, and yes, I take Nootropics, and then when they kick in I'm like, I'm going to, it's easier to go into a flow state and I just sit down and I just write and I write and I write. But if you take me out of the state, it takes me a long time to come back into it, and I'll probably just quit writing for the night. So I'm going to turn my phone off so someone doesn't text me or whatever. What's going on with that? I'm in the state versus I'm not in the state.

Jonathan: This is a really interesting phenomena, it's been referred to by psychologists checks them a high as a flow state. And the flow state is when you are sort of just pushing the envelope of working at your maximum capacity that you're still able to do, so you're not pushing so hard that you're struggling, you're just sort of right at your maximum capacity. And when people are in this state, they oftentimes lose meta-awareness. So there you're, so much in the flow state that you may lose track of time. You may not even think about the fact that you're in flow state. In fact, if you stop and you think, wow, this is great, I'm in the flow state-

Dave: It goes.

Jonathan: ...it's gone. So it's a really a fascinating state. Many creative individuals indicate that this is one of the most pleasurable experiences that they can have. But the interesting thing is that they aren't even thinking about how pleasurable it is until afterwards. They're just so absorbed in the experience at the time.

Dave: Some of the most frustrating and beneficial neurofeedback training I've done, and something that's a part of what I do today with clients, is figure out how to get into a state like flow state, where that sort of pleasurable state where like good stuff is happening. But then, universally, as soon as you notice and go, yay, it runs away. And to be able to just go into the state, go out of the state, go into the state, so many times that are frustrating until eventually realized, you know what, and now I know what it feels like to notice it and I know what it feels like to knock myself out of it. So I'm going to notice it without noticing it, and I can stay in the state and just enjoy the state without having to celebrate it or judge it or anything else. But I mean it takes a week. Like constant frustration to get there, but it really changed, I think, my cognitive function. Or maybe I just convinced myself that did.

Is there a practice that you've discovered, maybe with your meta lab or something around creativity that allows people to be in that creative state without popping themselves out of it so easily?

Jonathan: Yeah, that's a wonderful question. We've been talking recently, I mentioned this idea about meta-awareness and typically with meta-awareness, it's this very verbal propositional thing. You think, "Ah, I was mind-wandering again," or "Oh, I'm in the flow state." And that verbal propositional element to it we think is one of the things that makes it, well it's helpful if you're mind-wandering, you need to really do a wake up call to realize that you need to get out of it. But when you engage in that verbal propositional mode and you're in the state, then that can knock you out. So what we hypothesize may be sort of key is this intuitive meta-awareness where you're able to tacitly know that you're in the state without having to verbalize it to yourself. And we think that this is a technique that, or a state of mind that individuals who've practiced mindfulness meditation may have increasingly developed an ability to acquire. But, I think it's even just recognizing that you can have this capacity, you just sort of notice, without making that noticing very explicit may be an important element to this approach. But to be honest, this is an area that we're just now starting to investigate. And I would welcome, listeners or anyone else's suggestions about techniques that they've found to sort of foster this sort of intuitive meta-awareness.

Dave: Do you have something, some web based thing, where people can give you ideas. I don't want to give out your email address. We can if you want, but you might get 500 emails from smart people or crazy people. I don't know both.

Jonathan: They can, they can go to my website if they Google META Lab at UCSB, and they'll find various ways to offer comments and so on.

Dave: Beautiful. Yeah. So guys, if you have a really cool idea, it's amazing how much you could affect the human condition, if your idea really has merit and that becomes what's researched instead of 20 years of research and $1 million on something else that's not as good. So you have a good idea. I'm pretty sure Jonathan would appreciate hearing what it is, and I appreciate you doing it.

Something else that you've talked about in your work, Jonathan, is what having a childlike perspective does for fostering imagination and productive reasoning. So I'm a parent of two kids, 12 and 9, and I'm pretty sure that most of my creative cognitive function these days is dedicated towards dad jokes. You know, the bad puns. I think my kids go "ahhhh" and things like that. But there is a playfulness that happens when you're around kids. How important is it for people, whether they have kids or don't, to go spend some time with kids in order to make their creativity and their mind-wandering and wondering effective?

Jonathan: Well there was a really nice study which had people either imagine themselves last week or imagining themselves when they were, I think it was 10 years old. So they spend a little bit of time imagining them in those two different contexts. And then they were given a creativity task and what was found is that when they imagine themselves as a kid, they were markedly more creative than when they imagined themselves last

week. So there seems to be something about the mental state of being a child, in this case, imagining it. But it seems very likely, I actually don't know of any study which has specifically looked at interacting with kids and its effect on creativity. But given the study that I just mentioned, I think it's very likely that interacting with kids and, and especially trying to get into that curious, playful state of, and one of my favorite qualities that kids have that we oftentimes lose is wonder, that by getting into that state of wonder, of curious wonder, that that is likely to really enhance creativity. And we do find consistently a very powerful relationship between curiosity and creativity.

So being open minded, being curious, like a child engaging in wonder, that seems to be really powerful. And what better way to do that then to interact with creative, curious kids filled with wonder.

Dave: Very, very well said. And kids can be frustrating because they constantly interrupt your mind-wandering.

Jonathan: Well there's that.

Dave: Or your meditation, if you want it to be mindful. But on the other hand, there's something special when they say, "look at this flower" and you're like, I haven't looked at a flower like that in 40 years, but they're looking with that sense of wonder. So, I share your perspective. If someone does a study on that, what would happen if you, you know, played with your grandkids for a half hour a week? Probably something good.

Jonathan: I think so.

Dave: One bonus topic before we get to the end of the interview, and this is something else you've written about that isn't about a mindfulness and mind-wandering. You talk about the value of meta-science for turning the lens of science on itself to figure out why findings don't always replicate. What is up with that?

Jonathan: Oh boy. Well so in recent years, there has been increasing attention to the fact that sometimes scientific studies do not replicate to the degree that we might have expected them to. This has been sometimes referred to as the reproducibility crisis. I think crisis may be an overstatement, but it certainly is the case that there are a number of studies that we thought were robust that turned out not to replicate to the degree that we thought that they had.

And so what I've argued is that what we need to do is to turn the lens of science onto itself to begin to understand what are the conditions under which scientific studies are more likely to replicate? What are the conditions under which they are less likely to replicate? And then more generally, can we use this new movement to really get a deeper understanding about all the different stages of science, not just through replication, but also the creativity of scientists. What are the techniques that scientists used to be maximally creative? Or on the other side, why does some scientific ideas stick versus other ideas that don't? What is the role of the review process and subjectivity in the scientific process?

So there's really a whole set of fascinating questions. What is the mix of novelty to the following, the sort of the, within the standard traditions. And what's found, for example, in this case is that the scientific studies that have the biggest impacts are ones that have well established elements that they really sort of follow through and existing literature, but then they introduced something from left field. It's that the mixture of the novel with the well worn that seems to be sort of the sweet spot for the kind of ideas that really have a big impact.

So by beginning to quantify and really investigate carefully the whole scientific process, I think there's a real opportunity, not only to address this reproducibility question, but to more generally begin to understand the scientific process and ideally to enhance it.

Dave: All right. I absolutely love that, and I would love to see more reproducibility. It seems like part of the problem too is just there are a lot of variables where we tell ourselves "Oh, I controlled for all the variables," but you just didn't think they were variables. Not My favorite one is, turns out the gender of the person who feeds the mice is a huge variable in how, in what happens to the mice. They're much less stressed when women feed them than men. And we didn't track that. And so now we understand circadian biology. Do you know the flicker rate of the fluorescent lights in your mouse's cage? I don't know, but it might've mattered. And so I kind of felt like this amazing universe of variables, and we haven't yet determined which ones are important or not, but we probably don't know all of them.

So the good news is there's fertile ground for science for the next hundred years and those kinds of problems, right?

Jonathan: Absolutely.

Dave: Now, speaking of the next hundred years, that is our final question for the interview today, Jonathan. And this has to do more with attitudes around aging. I've been out there, and I will freely admit I am taking advantage of the placebo effect here, as well as every other effect I can find. But I am actively working on what I think is achievable of living to at least 180 years old in such a biological state that I actually want to be 180 years old. How long do you think you are going to live, given what you know about science, given what you know about where we are as a species?

Jonathan: Me personally?

Dave: Yup.

Jonathan: Well, my father passed away a year ago at 85.

Dave: I'm sorry.

Jonathan: So I guess that if I were just to sort of do the, and then you sort of expect that medicine and so on will improve from there, so I guess I think I've got a good shot at making it to

90. And then past that it's going to be, I mean I'd be, I'd consider myself very fortunate to make it that far.

But, you know, it's a really interesting question and it's very hard to predict. I think that there is a real possibility that there're going to be some really major advances in understanding, and ideally even reversing the aging process. I sometimes fear that I'm going to just miss it. You know, I think that's definitely a concern. But I think it's definitely something to strive for, but at the same time, I don't know, 180? I don't know. I'm not, I worry that people may get to a point where they can live to that age, but the quality of life and the, that it's just not worth it. And what's going to happen is that people are going to be sort of sustained at a level that may not really be a sufficient quality to really justify it.

Dave: Yeah. That's the big debate right now is, does old age look like wheelchairs, tubes, monitors and putting your car keys in the fridge? At which point, who wants that? Like you'd rather get out of the way and let someone else live a life that that is really satisfying and experience the world. On the other hand, you ask most people who are in those states, do you want to go now? And most of them are like, not really. So you know, you can be 99 years old. How much longer do you want to live? They're going to tell you a hundred.

Jonathan: It's really interesting. I recently was talking to somebody who has done research on people with locked-in syndrome. And this is where people have absolutely no ability to move anything, they can maybe communicate by moving their eyes. So there is some way to communicate with these individuals, but by and large, they have very difficult time moving at all. And you'd think that people in that situation would be just utterly miserable. And what this person was saying was just that if a zero is neutral and five is as happy as you can be, that they tend to be around a two or a three. So not that much different from the rest of us. So it seems that even though we think that when we're in these dire situations, life would be entirely unlivable, at least people persuade themselves that they are a reasonably happy.

Dave: That is a profound way of looking at it. And I'm working on a, actually I just finished the book I talked about writing during the show, my anti-aging book, and it comes down to the question we had earlier, Jonathan. When you play with a younger person, it does something around that playfulness. And I find that by cultivating friendships with people in their seventies, eighties and nineties, it does something for the opposite side of that, whether that's the wisdom circuit or something. But there's a role for having the whole range of ages in your life and I feel like, it is time to bring back the village elder.

Jonathan: Absolutely.

Dave: That's part of the anti-aging stories. We want old people full of energy and full of life and full of wisdom, because that's pretty useful to have around, and just worthwhile.

Jonathan: One thing to point out about the aging is, is that as people get older, they actually, as long as their health is sustained, they actually get happier. They become less neurotic.

They begin to increasingly understand what's important to them and to engage in the things that are really of value and meaning to them. So even though this is really a youth culture, there's a tremendous amount of wisdom that people discover on their own through the aging process, they become more conscientious. So yes, there's a great deal to be said for the aging and for interacting with people who've discovered that kind of wisdom.

Dave: Well, I think you're one of those people who's well on your way to discovering that kind of wisdom. I'm working on it myself, and thank you for sharing your wisdom with guests on Bulletproof Radio today. You mentioned earlier that people can find you most probably easily by googling META Lab, Jonathan Schooler. That's the easiest way to find you?

Jonathan: Yes.

Dave: Well, thanks for doing your work. I really appreciate this attention to that 20% of the time where people are always focused on the 80%, and I think there's great value in that. And you've caused me to think about the creative sparks in my work and where they come from. And so thanks to your work for inspiring me to be a little bit more meta about my own approach to things.

Jonathan: It's been a real pleasure.

Dave: If you enjoyed today's episode, you know what to do. Go back to that two minute section of quiet and listen to it again. And think about nothing and see what's in there. Enjoy your day.