Dr. Emily Balcetis: Tools for Setting & Achieving Goals | Huberman Lab Podcast #83

My guest this episode is Dr. Emily Balcetis, PhD, Professor of Psychology at New York University (NYU). Dr. Balcetis' research focuses on how our perception of the world, particularly our visual perceptions, influences our level and persistence of motivation, how we conceptualize goals, actual goal achievement, and our emotional state as we pursue goals. Dr. Balcetis explains how to best visualize and overcome challenges in pursuit of larger, complex goals. We also discuss the science of how to define goals and intermediate milestones, overcome obstacles, and effectively track progress. This episode highlights science-based, immediately actionable tools that anyone can use to set and achieve physical and/or cognitive goals more effectively.

#HubermanLab #GoalSetting

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- Welcome to the Huberman Lab Podcast, where we discuss science and science-based tools for everyday life. I'm Andrew Huberman, and I'm a professor of neurobiology and ophthalmology at Stanford School of Medicine. Today, my guest is Dr. Emily Balcetis. Dr. Balcetis is a professor of psychology at New York University, her laboratory studies motivation, goal setting and tools for successful goal completion. I learned about Dr. Balcetis's work some years ago because I'm a vision scientist, that is, I study the visual system, and I heard about this incredible psychologist at New York University who was studying how vision, that is, how we visualize problems can predict whether or not we will successfully overcome challenges and how we strategize in order to set and meet goals. And in 2020, I learned of Dr. Balcetis's book, which was written for the general public, entitled "Clearer, Closer, Better: How Successful People See the World". And I read both the hard copy of the book and listened to the audiobook, and I absolutely loved the material. As you'll learn directly from Dr. Balcetis today, how people visualize a problem, that is, whether or not they think of a goal or a problem as residing at the top of a very steep hill, or on the top of a shallower hill, or whether or not they visualize a goal or a problem as far off in the distance or closer to them in the distance, visually, in their mind, strongly dictates whether or not they will arrive at the challenge of meeting a goal

or overcoming a problem with more energy or less energy. Indeed, it dictates whether or not they can push to immediate milestones, or whether or not they will think they have to overcome the entire task all at once. Basically, Dr. Balcetis's work has discovered that how we visualize a problem or a goal in our mind has everything to do with how we lean into that goal, whether or not we think of it as overwhelming or tractable, whether or not we think that we can overcome that goal and then it will lead to yet more possible rewards and goals, or whether or not we feel that we're going to arrive at the finish line and then just be overwhelmed with fatigue. In other words, how you visualize things in your mind, and when I say, "Visualize," I mean, literally, how you visualize them as a visual problem or a visual goal, has everything to do with whether or not you will be able to meet those goals and whether or not they will lead to still greater goals that you will be able to achieve. Today's episode is an especially important one, I believe, because you're going to learn about quality peer-reviewed science from the expert in this field of goal setting, motivation and pursuit, and you're also going to learn an immense number of practical tools that you can apply toward your educational goals, your career goals, relationship goals, goals of any sort. By the end of today's episode, you will be better equipped to set and achieve your goals. Dr. Balcetis also shares with us her own experiences of how to set, visualize and achieve goals, and she does that within the context of her role as a parent, as somebody navigating relationships of various kinds, and a demanding career. So again, I think that you'll find the information today to be both extremely academically grounded in terms of research,

00:03:24 Momentous Supplements

extremely practical and realistic in terms of how you might apply it in your own life. I'm pleased to announce that the Huberman Lab Podcast is now partnered with Momentous supplements. We partnered with Momentous for several important reasons. First of all, they ship internationally, because we know that many of you are located outside of the United States, that's valuable. Second of all, and perhaps most important, the quality of their supplements is second to none, both in terms of purity and precision of the amounts of the ingredients. Third, we've really emphasized supplements that are single-ingredient supplements, and that are supplied in dosages that allow you to build a supplementation protocol that's optimized for cost, that's optimized for effectiveness, and that you can add things and remove things from your protocol in a way that's really

systematic and scientific. This is really hard to do if you're taking blends of different supplements, or if the dosages are such that you can't titrate, or that is, adjust the dosages of a given supplement. So by using single-ingredient supplements, you can really build out the supplement kit that's ideal for you and your specific needs. If you'd like to see the supplements that we partner with Momentous on, you can go to livemomentous.com/huberman. There, you'll see those supplements, and just keep in mind that we are constantly expanding the library of supplements available through Momentous

00:04:38 Thesis, Levels, ROKA

on a regular basis. Again, that's livemomentous.com/huberman. Before we begin, I'd like to emphasize that this podcast is separate from my teaching and research roles at Stanford. It is, however, part of my desire and effort to bring zero cost to consumer information about science and science-related tools to the general public. In keeping with that theme, I'd like to thank the sponsors of today's podcast. Our first sponsor is Thesis. Thesis makes custom nootropics, and as some of you have probably heard me say before, I am not a fan of the word nootropics because nootropics means smart drugs, and frankly, as a neuroscientist, the notion of a smart drug is somewhat ridiculous, why? Well, it turns out that we have neural circuits in our brain that get engaged for creativity, and yet other neural circuits that are engaged for focus, and still other neural circuits that are engaged for task switching, so the notion of a smart drug or a drug that can induce smartness, if you will, is simply not grounded in science. Well, Thesis understands this and has developed custom nootropics that are tailored to the specific types of cognitive demands or physical demands that you might be facing. If you go to Thesis's website, you can take a quiz, and from that, they'll give you a sample of different nootropics that you can try so that you can create a customized kit of nootropics for your specific needs. To get your own personalized nootropics starter kit, just go online to takethesis.com/huberman, take that three-minute quiz and Thesis will send you four different formulas to try in your first month, that's takethesis.com/huberman and use the code Huberman at checkout to get 10% off your first box. Today's episode is also brought to us by Levels. Levels is what's called a continuous glucose monitor, some of you may have heard of these before, others of you perhaps have not. Basically, it's a small device that you wear on the back of your arm, it's an app that you install on your

phone, and whether or not you are fasting, or you just ate, or you ate several hours ago, you can get a realtime measurement of your blood glucose, which turns out to be extremely informative. I first started using the Levels continuous glucose monitor about a year ago, and it's taught me so much about how I respond to specific foods in terms of blood sugar spikes, how I respond to exercise, even the sauna, it turns out, can modulate my blood glucose levels and your blood glucose levels in very interesting ways. So all of that is translated into a huge number of very directed changes that I've made in terms of what I eat, when I eat, and how I schedule exercise relative to eating and sleep, et cetera. If you're interested in trying the Levels continuous glucose monitor yourself, you can simply go to levels.link/huberman, that's levels.link/huberman. Today's episode is also brought to us by ROKA, ROKA makes eyeglasses and sunglasses that are of the absolute highest quality, and they also have some unique characteristics. The company was founded by two All-American swimmers from Stanford, and everything about ROKA eyeglasses and sunglasses were designed with performance in mind. ROKA eyeglasses and sunglasses can be worn while running or cycling. If you get sweaty, they won't fall off your face. And they're extremely lightweight. In fact, most of the time, I can't even remember that I'm wearing them. I wear ROKA eyeglasses when I read at night, so I wear their readers, and I wear sunglasses at various times throughout the day. The great thing about ROKA eyeglasses and sunglasses is that even though they were designed for athletic performance, they have a terrific aesthetic. So unlike a lot of so-called performance glasses, that make people look like cyborgs, in my opinion, ROKA eyeglasses and sunglasses are the sort that you could wear out to dinner, that you could wear to work, they have a terrific aesthetic. If you'd like to try ROKA eyeglasses or sunglasses, you can go to ROKA, that's R-O-K-A, .com, and enter the code Huberman to save 20% off your first order. Again, that's ROKA, that's R-O-K-A, .com,

00:08:08 Vision & Motivation

and enter the code Huberman at checkout. And now for my discussion with Dr. Emily Balcetis. Well, thanks for being here. - It's my pleasure. - Yeah, I've been looking forward to this for a long time, because as a vision scientist, who is also very interested in real-life tools and goal setting and motivation, your work lands squarely in the middle of those interests. So just to kick things off, could you tell us just a little bit about the relationship

between perception, and in particular, how we see the world, and goal setting and goal retrieval. It's a vast landscape, but you're the expert, so I'll turn that over to you. [Emily laughing] And then, as time goes on, I may have some additional questions as it relates to different kinds of vision, but what's the deal with vision and motivation? How do those two things link up? - Yeah, totally, I mean, when psychologists ask people, like, "What are you doing to help make progress on your goals?" they say all kinds of things, but a couple things always pop to the top, which is, "Try to shock myself in encouraging ways, and self-pep talks," or, "I remind myself of how important it is to do this job," or, "I'll put up Post-it notes around to constantly be nagging me about what I need to do." So those are common tactics that people use, and what we'll notice is that those are really effortful, having to constantly remind yourself, having to constantly talk to yourself, having to create those Post-it notes, remember to look at them, all of that takes a lot of time and effort and commitment, and so what a surprise that people burn out, right? It's exciting to work on a goal when you first set it, you might make some initial progress, but then eventually we get not even to the halfway point before things get real, [laughing] things are challenging, and we fall by the wayside. And that's, I think, because those tactics that are our go-to strategies are themselves a goal to maintain. So it's double sided, we're putting so much on ourselves to try to advance the thing that we originally set out to accomplish. So then, with my team, I was trying to think of, like, "Well, what are strategies that don't require as much effort, that we can automate, that we can take advantage of what's already happening within ourselves, within our body, within our mind, that might overcome one of those challenges, that'll be easier, more automated?" And that's when we started to land on the idea of vision, right? We look at the world without even thinking of it, for those of us that are sighted, and we thought, "You know what? There are strategies that we can use to look at the world in a different way and that we can automate that might help us to overcome some obstacles, to make progress on our goals, to maybe literally see opportunities that we hadn't been able to see before." So we started playing around with the idea of visual illusions to see, like, "Do people even know that there's other ways of seeing things around them? Can we tweak that, or is there room for intervention? Can we encourage people to take a new way of looking to see things that they hadn't seen before?" And that's what really opened us up to trying to look at that intersection between vision science and motivation science. - That's great, and I always say, and here, I'm strongly biased as a vision scientist, that vision is the dominant sense by which we navigate the world and survive. I love this idea

of real-world, realtime access to vision. And I'm certainly familiar with how goal setting or Post-its and magnets on refrigerators can have an immediate impact, but then over time, they become so part of the visual landscape that you overlook them, and we know, as vision scientists, if something is stably in your environment, eventually, you're blind to it,

00:11:37 Tool: Narrowing Visual Focus & Improving Exercise

so that makes good sense. So you've published a number of studies in this area, but maybe you could highlight some of the more, what you would consider important findings in the area of how people can adjust their vision in order to meet goals more quickly and more efficiently, and perhaps also how we all arrive at goals with different visual perceptions, and that, in some way, may divide us into highly motivated and less motivated people, in other words, what's the link between vision and motivation, and how can we leverage that in order to better reach our goals? - Totally, so we started thinking about, "What are the goals that are most important to people that they struggle with the most?" So we asked hundreds, thousands of people what their new year's resolutions are, we looked to all the other polls that do the same kind of work, and regardless of where you look, or who you ask, or when you ask it, people's number-one goal is something related to their health, right? To lose weight, to exercise more, to get out, get more steps, for mental wellbeing, physical wellbeing. And that's like the number-one goal every January 1st. So if we were able to accomplish that goal, you'd think it would drop [laughing] a little bit in the rankings, but it doesn't because it's really hard. So we thought, "I wonder if there's a way for us to make some progress on that, on helping people to exercise better, more often, stick to it longer, and make some progress there?" We know diets don't work. [laughing] Why don't diets work? For the same reason that that self-talk doesn't work, is that we go in it, full bore, hardcore, and it requires a major commitment and effort to a lifestyle change. So again, we were looking for something that might be easier than that, that could produce big payoff, right? That's the golden ticket, [laughing] is something that requires less effort for a bigger payoff. So one of the first things that I did was go over to Brooklyn, to this old armory building, it used to be a military armory space, yeah. - I think I know that building. - Yeah, it's beautiful. - It's a beautiful building, now, that houses a lot of businesses, right? With plants on the walls, is that the one? - Yeah, there's businesses, there's a couple of armories all around the boroughs here around New York City, and the one in Brooklyn in particular is now YMCA, right? So it's

a family YMCA, that's within this beautiful old redbrick building that used to be a military establishment long, long ago. And what's really cool is that, one winter afternoon, somebody had invited me, a physical therapist said, "Hey, you should come out and check out what's happening here, with your interest in exercise and trying to find new ways of helping people, new tactics that they can add to their tool belt, I think you're going to find some interesting people that are working out there." So I showed up, I look around, there's families, there's new moms, there's kids, moms trying to get kids to burn off some winter energy that they have, there's people that look like they're just there for their, every couple of days, going out for a run. There's some people that look like they're training with a team, and that's who this physical therapist introduced me to, was the coach of this team. There's a bunch of people that were sitting down on the ground, and I would be hard pressed to know who is the high school student that's in this group, and then who, as it turns out, are some of the fastest runners in the world. One of the people that was in the last Olympics before I showed up, won the gold medal for the 400 meter. And from the looks of them, I mean, of course, their bodies are in better shape than mine, but there's nothing so, of course, they're not wearing their medals, there's nothing pretentious about how they're walking around or anything like that, that would lead me to know, like, "This person's amazing, and they probably have some insight that I don't have." So once I got introduced to them and knew who are these people that were part of this pretty elite training team that happened to work out at this family gym, I had the chance to talk with them about, "What strategies do you use?" Now, I am not an elite runner, and having recently had a baby, I'm not really a runner right now at all, but I thought, "When these people are running, I bet they are hyper aware of everything that's going on in their surroundings. Where are they relative to the competition, what's happening in their peripheral vision, what's going on on the side, who's behind them, who's in front of them? They probably have this master sense, this master visual plan at any point in time, and that's what probably makes them elite." So when I started asking them, "Is that the case, do you really pay attention to what's in your surroundings, what's behind you, what's on the side?" They said, "No," all of them said, "No, and sometimes when I do do that, it's a mistake, it doesn't work for me." So that was surprising and totally went against my intuition about what they do that likely contributes to their success. What they said instead was that they are hyper focused, they assume this narrowed focus of attention, almost like a spotlight is shining on a target. Now, when they're running a short distance, that target might literally be the finish line, the line that

they're trying to cross. If it's a longer distance, they set subgoals, like the person, the shorts on the person up ahead that they're trying to beat, or they choose some sort of stable landmark, like a sign that they would pass by. And a spotlight is shining just on that, or they have blinders on the sides of their face, that's all they're paying attention to, this really narrowed scope of attention. And that was a strategy that all of these elite athletes said that they used, and those that were better rather than slower were ones that used it more. And I thought, "Oh, that's something we can play with, right? They are elite [laughing] and they are accomplished, but that visual strategy isn't necessarily something that you have to be in the perfect physical condition to be able to adopt, and so I wonder, can that help the rest of us who aren't competing for an Olympic gold and who have no chance of ever getting one, but who want to exercise better, have a better time doing it, and maintain a commitment to that exercise goal that they might have, that they might otherwise, by February or March, be giving up on, if they had said it at the beginning of January?" So that's really where the work started, was what you might call focus groups or case studies [laughing] of these incredible athletes. And then we did other studies, looking at people who aren't Olympic athletes, but who are competitive and New York Road Runners runners, and how are they running in races? And what we found is that those people who have better pace, faster pace, better time, they use that narrowed strategy more often than this more expansive or open scope of attention. And there seemed to be a correlation between that better performance among a wider swath of hundreds of runners, who are doing it competitively, but still, could be like the person that you're sitting next to in the office, or yourself, right? And the more often that they did it and the more consistently they had adopted that, that technique of the narrowed focus of attention, it seemed that they were doing better in their runs. So then we started thinking like, "Okay, what about people who aren't competitive runners? What about like my mom, [laughing] can she do that, or me when I'm trying to get back on the bandwagon and exercise more, is this a tactic we can teach people?" The answer is yes, you can tell people about what these Olympic athletes are doing, you can tell them about what the New York Road Runners runners are doing, and just using the same language that I just used with you, right? "Imagine that there's a spotlight shining just on a target, choose something up ahead, the stop sign two blocks up that you can just see, and imagine that you have blinders on so that you're not really paying attention to the people that are passing by, or the buildings, or the garbage cans, or the trucks that are on the road, tune those out and focus in on that target, until you hit it, and then choose another

one, right? Sort of recalibrate, choose the next goal." And so we would test, like, "Can people do that?" I mean, if you're listening right now, you probably are imagining that experience too, and the answer is yes, like, "I can imagine that, I know what those words mean, and I can do that." And our work found that too, that people can do that, we have them say out loud, "What is it that's captured your attention?" And of course, "Sometimes something in the periphery, like movement, captures our gaze and we are pulled there for an instant, but then we can refocus up again and adopt that narrowed attention." Now, one of the first studies that we did was teach that strategy and juxtapose or compare it against a group that we said, "Just look around naturally, you might see that finish line up ahead and there's things on the periphery, whatever your eyes want to do, whatever you think is going to work best, feel free to do that, and tell us what you're looking at." Then we gave them a finish line, we created sort of an exercise that's moderately challenging, but possible. We put ankle weights on that accounted for about 15% of their body weight, told them to lift their knees up, sort of high stepping to a finish line. So this would be challenging for them to do, but we said, "It's an indicator of overall health and fitness." Some of these people had narrowed their focus of attention and some were just looking more expansively or naturally. And what we found is that those people that we trained, just everyday normal people doing this moderately challenging exercise, they were able to move 27% faster. They could do the exercise more quickly, and they said it hurt 17% less. The exercise was exactly the same for all of the people, we set the weight, [laughing] we set the distance, it was in our lab space, so it was a constrained environment, everybody was in the same sort of circumstance, but yet their experience was really different, we helped them to move faster, burn calories at a higher rate, right? Exercise more efficiently, the amount of time they put in is going to produce a better physical outcome, and also, it didn't hurt them, right? They're saying, "It doesn't hurt as much." So we were really excited about that, right? Because it meant that this strategy, we could use it on people who were not elite athletes. It could be easily adopted, a quick training session, right, can teach people to look at the world in a different way. Again, this narrowed attention was different than whatever they do naturally, the comparison group, but it had a big outcome, it had a big difference on the way that they were engaged in the exercise. It was some of the first work that we did, and then, since then, we've done, I don't know, dozens more studies to look at, "Well, what happens with that and what else can we do with playing around with this?" - Yeah, those are impressive differences

00:21:39 Adjusting Visual Attention & Perceived Fatigue

as a consequence of narrowing visual attention. Couple of questions about the actual practice of narrowing attention, is there any indication of whether or not subjects are constantly updating their visual attention? So for instance, if let's say the goal line is in view, literally, from the beginning, I could imagine just holding visual attention on the goal line, but if it's a oval track, or it's a trajectory along a trail, or through a city, how often do you think they are updating their visual aperture and setting a visual goal? And I could imagine that there's some energetic expense to that, so meaning, you wouldn't want to do every crack on the sidewalk, unless those cracks on the sidewalk were very far apart. - [laughing] Right. - Because I think, at some point, that itself would be exhausting. So is there an optimal strategy or a semi-optimal strategy? - Yeah, so those Olympic athletes that we started by interviewing, they tended to be sprinters, they were more often sprinters, short-distance sprinters. So when they said like, "Yes, I narrow in more than I assume an expansive focus," that's because they're not going that far, right? They have to do it as fast as humanly possible, but they're not going that far. And so we started asking that question too, about, like, "Well, wouldn't that be tiring?" And the answer is yes, so when we start to look at, well, people who aren't sprinters, who are accomplished, but who are more long-distance runners, that's what we find that they do, is that they're using that narrowed attention strategy strategically, and it increases in use, they use it more often as the race progresses, and they really start to do this major switch [laughing] at about the halfway point of say like a 10-kilometer run. So people who are seasoned runners, they really start making a switch with what they're looking at about halfway through, and that's where they more often, more frequently and are more intentionally adopting a narrowed focus of attention when they're in the last couple miles of a run, when maybe their resources are starting to get more thin, maybe their motivation is starting to fade. That tipping point in the middle is, with any kind of goal, where people struggle the most, and that's when they're doubling down on a strategy that they know to be effective. So at first, longer-distance runners are not using that narrowed strategy, they're looking more expansively, because I think that that, well, first of all, distraction [laughing] is a thing, it's useful. Not necessarily that they're distracting themselves, because people are still trying to hold pace and jostle among probably a more concentrated group of runners, but it is a strategy that they use, and then sort of

wean off of as the race goes through. And it's particularly effective when we're looking for that last push, right? The last push to get over the finish line, when you might be literally neck and neck with somebody that you're trying to just beat out, or when you're most tired, but you know that last push, you don't want to drop off, and when you want to push through hard through that finish line, that's when people are using it at its peak level of intensity. - I see, yeah. To me, this makes total sense why it would work, without going down the rabbit hole of visual neuroscience, something for another time, that when we do these vergence eye movements, when we bring our eyes to a visual target, it's clear that some of the brainstem circuitry for alertness gets engaged to a greater degree. The other thing is that we know that when we focus on an object, that the optics of the eye change

00:25:14 Tool: Visual Focus “Spotlight”

and narrow the visual field. So that brings about, this is a very detailed question, but I'm sure the audience is wondering, if let's say I'm focused on a goal line or an intermediate goal, are they focusing on a specific point or is it kind of the entire horizon of that goal? Because the finish line is indeed a line. And of course, it's impossible to know what someone is actually doing in their mind's eye, but how do people report this? Do they see it literally as a spotlight? And if so, how broad is that spot? - Yeah, so what is the length [laughing] of their aperture rather than maybe the diameter or the sphere size of it? In our interviews with people, our sort of focus group studies, it seems like it's more like a circular point. And that's in fact what we're teaching people, what we're training them to do, so rather than going broadly, looking across a line from left to right, we are encouraging them to imagine a circle of light that's shining on some target. Now, of course, a finish line is a line, but if they're staying in their lane, if they're on a track, right? You can imagine that there is a circle shining just on where in their lane they'll cross that finish line, or if it's a stop sign, you could imagine a circle of light illuminating that. So that's what we're teaching people to use and that's what seems to be effective to maintain that focus rather than sort of being pulled to engage with peripheral vision. And there's some amazing people, some runners in history, like Joan Benoit Samuelson, she's one of the first female marathon competitors, who has won multiple marathons. She's Canadian, I think she's won, feel free to correct me, like 10 marathons in her life. And she talks about sort of not assuming this wide but narrow, [laughing] wide but not

deep or tall attentional focus. She talks about, like, "Finding the shorts on somebody ahead of me and focusing on those shorts," until she passes them, and then resetting that goal. So in her interviews that she's done with runners magazines, she talks about it in terms of this circle of attention. - Mm, I think I've experienced this a little bit, because we're visiting New York now to do this interview, and runners here seem more competitive, recreational runners here seem more competitive. People walking on the street seem competitive. - Yeah. [laughing] - You're walking at near pace to somebody, they'll quickly speed up. If you speed up, they'll speed up. - Yeah. - I think there have been some studies about walking speed in different cities, and New York ranks among the fastest walkers around. I won't mention the slowest-walking cities. [Emily laughing] 'Cause we don't want to cast any judgments. But fascinating, and again, makes total sense based on the way that the visual system

00:27:57 Tool: Goal Gradient Hypothesis, Visual Spotlight to Increase Effort

measures both space and time. - Yeah. - Something maybe we'll get into a little bit later, but I'm curious whether or not the whole thing works in reverse as well. Meaning, do people who are very motivated to exercise, do they think this way naturally? People who are averse to exercise or who find it hard to get motivated to exercise, do they view the world differently, literally? - Yeah, yeah, I have so much that I can say about this, so [laughing] if you'll humor me, I'll give you a couple different stories about how we can answer that. - Please. - So you don't have to do a deep dive into vision science, which, of course, you are capable of doing, but what I can share with you is some animal studies where this work kind of first started. This is in the 1940s, 1950s, rat labs, mice labs. And they were looking, those were the first models of human behavior that people were trying to understand motivation, motivation science within. So they would deprive these poor rats and mice of food or water, so that they were motivated to get it. [laughing] They were hungry and they were thirsty and they had practice running a maze so they knew where they could find that food or water, whatever that they were looking for. And what these researchers were studying was the pace of movement through the maze. So as the rats were going through the maze, they found that even though these rats were hungry and they're having to expend limited caloric energy to make it to the finish line, they actually ran faster the closer they got to that finish line. So once that finish line became nearer to them, they actually used their resources, probably

suboptimally, to make sure that they crossed the finish line and got their reward. So that was some of the first early work that was showing that proximity to a goal increases the investment in resources that people, that animals use to meet that goal, even when they don't have that much spare. And with the mice, the same kind of thing, they actually had these little harnesses on them, they were looking at how hard do the mice pull to try to make it to the food or the water that they were trying to get. And same deal, the closer they got to getting their reward, the harder they were pulling, even though they didn't have that much energy to spare and they had already used some up getting to that finish line. So that early animal research from the 1940s, 1950s, then spurred a whole wave of work in humans. Do humans do the same thing? Even when they're tired, but they can see or they can feel that their goal is close, do they double down and work even harder to cross that finish line, either a literal finish line, if we're talking about exercise, or a metaphorical finish line if we're talking about any other kind of goal that people might have? And the answer is yes, they called that the goal gradient hypothesis, the closer you get to the goal, generally, the harder people and animals work to finish that goal. That's what led us then to think, "Okay, those rats, those mice, those people are seeing a finish line, right? And it's when they're maybe seeing that finish line, seeing that reward, seeing the goal they're hoping to accomplish, that is what's leading them to try harder, to invest more so that they can finish it off. What if we induce that illusion of proximity? What if we can induce a visual illusion, a visual experience that approximates what the real rats and mice were actually experiencing as they got closer?" So that is what is happening, that's what's happening visually when we create that narrowed focus of attention, when we tell people, "Imagine there's a spotlight on the shorts of the person up ahead, or the stop sign that you're seeing," it induces an illusion of proximity that then is responsible for people trying harder, walking faster, or feeling that it defied their expectations and that it wasn't as bad as they thought it would be. So we do things like measure, like measure their visual experience, like, "How far away is that finish line?" Of course, we can ask them to report in feet, "How many feet is it?" Ah, but that's challenging, right? Nobody really knows what three feet versus four feet really looks like, but they do, so we can ask them how many feet it is. We also use these other measures of, like visual matching measures to know that distance to the finish line looks about as far away as this other target, their matching up their visual experiences. So what we know is that inducing that narrowed focus of attention is creating an illusion of proximity, that goal looks closer to them. And then there's all kinds of downstream, motivational

and psychological effects that happen from feeling like you're closer, by visually misperceiving that space, it can have a really positive consequence. So your first question was, "Which way does it go? Does it go both ways, that people who are better runners happen to do this thing?" Yes, some of our research shows that, that if they, for whatever reason, happened upon this strategy and continued to practice it, they tended to be the better runners. But we also know from our experiments in the lab, where we take people who don't know about these strategies, and by a flip of the coin, we randomly assign them to either learn the strategy and use it or do whatever comes naturally to them, we can create that illusion of proximity, that has a direct and causal impact on improving their performance when they're exercising. So yes, it goes both ways, but you can also teach yourself that you don't have to just rely on luck,

00:33:38 AG1 (Athletic Greens)

luck of the draw for being a person who happens to be better at exercising or whose eyes happen to do this on their own. - Before we continue with today's discussion, we're going to take a brief pause to acknowledge our sponsor, Athletic Greens, also called AG1. I started taking Athletic Greens way back in 2012, so I'm delighted that they've been a sponsor of this podcast. Athletic Greens contains vitamins, minerals, probiotics, digestive enzymes [laughing] and adaptogens, so it's got a lot of things in there, and that's actually the reason I started taking it, and the reason I still take it once or twice a day. It essentially covers all of my nutritional bases, and the probiotics in particular are important to me because of the critical importance of what's called the gut-brain access, that is neurons and other cell types in the gut, in the digestive tract, that communicate with the brain and the brain back to the digestive tract in order to control things like mood, immune function, hormone function, and on and on. Whenever somebody has asked me what's the one supplement they should take? I always answer, "Athletic Greens." I gave that answer long before I ever had this podcast and it's the answer I still give now, for all the reasons that I detailed just a moment ago. If you'd like to try Athletic Greens, you can go to athleticgreens.com/huberman to claim a special offer. They'll give you five free travel packs that make it really easy to mix up Athletic Greens while you're on the road, plus a year's supply of vitamin D3K2, which are also very important for a huge number of bodily factors and brain factors that impact your immediate and long-term health.

00:35:00 Defining Goals vs. Accomplishing Goals, Dream Boards & Goal Lists

Again, that's athleticgreens.com/huberman to claim that special offer. The most pressing question I have in my mind is, can we, I, all of us, use this strategy to make the starting line a goal point? Because for a lot of people, it's not about going from start to finish, it's about getting to start. And I would say, here, I'm estimating, but 15% of the content on social media is about motivation and how to get motivated to do things. Neurochemicals like dopamine, of course, being at the heart of motivation. In my mind, I'm making strong links between some of these visual aperture effects and goal lines and dopamine that we could also dive into. But the simple question is, can I use this finish line strategy to make the start line a goal and get my system more engaged or motivated? And is there any physiology, or physiological changes, I should say, to reflect the idea that maybe just visually focusing on the start line would actually get me more excited as opposed to make me less excited to engage in effort? - Mm-hmm, there's certainly vision science that's tied up in that very first stage of goal setting, like identifying what that goal is in the first place and taking those first steps. A lot of people's go-to strategies that involve vision are vision boards, or dream boards, or Post-it notes, right? They're creating some sort of visual representation of what it is that they want to accomplish, "Where is it that I want to be in five years, 10 days, 10 years?" Whatever that timeline is that they're working under. The idea of vision boards or dream boards is that you, almost like a scrapbook, [laughing] collect visual icons that reflect where you want to be to motivate yourself. It's a really common tactic that people use, and it's not bad to do that, right? For some people, just even knowing what they want in life is a major accomplishment, defining the goal can be really challenging for people, and that's a strategy that works and involves our visual experience, right? It's not just, people aren't saying like, "Why don't you just sit around and imagine what you want your life to be like in 10 years?" The strategy that people are suggesting is like, "No, cut out the pictures, put it on a board and stick it by your bathroom mirror so you see it every day," right? - Or make a list. - Or make a list, yeah. - People are big on these lists, I have a lot of friends that are like, "Have you made your list?" The list of things that you insist on having in the context of fitness, relationship, job, et cetera, et cetera, this seems more and more common now, yeah. - Yeah, totally, and the idea, like, "Write it down," right? They're telling you, "Write it down," or, "Create a visual manifestation of it." And so yeah, that's effective for

identifying what you want, but it may not actually be effective for helping you to meet the goal, to get the job done. So colleagues of mine at New York University have probed, "Well, why, why is that? Why is just thinking about what you want in your life and sort of putting yourself vicariously into those shoes, imagining what my life will be like if I can accomplish everything on this list, why doesn't that work?" Well, first of all, "Does it work?" The answer is no, "And why does it not work?" Because what happens, these colleagues, Gabriele Oettingen and her research team have found is that going through and dreaming about or, "Visualizing how great my life will be when I get X, Y and Z done," that is like a goal satisfied. "I have identified what it is that I want, I have experienced it, even if just in an imaginary way, I've had that positive experience of thinking about, well, how great my life is going to be when I get this thing done," and they start to sort of rest on their laurels. She's actually measured systolic blood pressure and heart rate, and they found that people who do that, who go through that experience of, "Visualizing how great my life will be when I get X, Y and Z done," their systolic blood pressure, the bottom number on your blood pressure reading, decreases. Okay, now, I'm all about finding ways to relax, especially in New York, right? You're constantly living at a high level of stimulation, and so like, "Cool, great, so maybe I should just think about how awesome my life will be when I get my bucket list done," but motivation scientists know that systolic blood pressure is actually an indicator of our body's readiness to get up and act, to do something. Now, that can be the going out for a walk, going out for a run, hitting the gym, it can also be things like doing math problems, [laughing] right? Even if it's something that's just mental, systolic blood pressure actually goes up in anticipation of your body or your mind needing to do something, taking the first steps on a goal. So then it helps us to understand of like, "Okay, if I've just created this dream board, this vision board, and put myself psychologically in that space of a goal satisfied, why is it bad that blood pressure goes down?" Because it means your body is chilling out, it's like, "All right, cool, I just accomplished something pretty major," right? "I actually now don't have the physiological resources at the ready to take the first step right now to do something about that." So that was a pretty monumental finding for motivation scientists, to understand that creating these dream boards, these vision boards, or to-do lists, might actually backfire, because it in and of itself is the creation of a goal and the satisfaction of the goal, and then people understandably give themselves some time to just enjoy that positive experience. - So much for "The Secret". - [Emily] Yeah, exactly, [laughing] exactly. - I guess now "The Secret" folks will come after me with pitchforks,

but. - I try to never say the name, [laughing] right? For that reason. - Well, I'm not afraid to say the name, I mean, I imagine that certain strategies might work for other people, but everything you're saying, again, is consistent with what we know about the physiology of dopamine circuits for motivation. I have a good friend who perhaps incidentally, perhaps not, is a cardiologist at a major university, said that one of the major errors that people make with book writing and completion is they will tell people they're going to write a book and people will say, "Oh, you definitely should write a book, everyone's going to love your book," and they never end up writing it. And his theory is that they get so much dopamine reward from that immediate feedback, with all the protection of never having the book criticized, that they never write the book.

00:41:28 Tool: How to Setting Better Goals & Identify Obstacles

I'm sure there are exceptions to this, but I guess it raises the question, what's the better strategy? - Yeah, so I'm not saying that people who enjoy dream board creation should stop what they're doing, that's not the take-home message here. - Nightmare board. - [laughing] Oh, definitely not that, no. - Okay, okay. - There's enough anxiety and fear in the world, we don't need to encourage more of it. But the process of goal setting shouldn't stop with articulating what the goal is. So at that same point that we're trying to figure out, "What do we want to do, what is my vision for the future?" in those planning sessions, we need to simultaneously think about a couple of other things. One is how are we going to get there? So take it out of the abstract, take it out of this idyllic visual iconography and start thinking about the practical day to day. We need to break it down into more manageable goals, not just, "My 10-year plan for myself," but, "My two-week plan, what can I accomplish in the next two weeks and the two weeks after that's going to set me on the right trajectory?" That's probably not surprising to anybody [laughing] who's been thinking about, "How do I set goals better?" Plan big picture, think big picture abstractly, but then also break it down more concretely, that's probably not surprising, but it's an important aspect of the goal setting process. Then, again, Gabriele Oettingen in my department has identified a third often overlooked or underappreciated stage that has to happen in the goal setting process, and that's thinking about the obstacles that stand in your way of success, and that, it will actually help improve motivation in the long run. And sometimes people think that that is counterintuitive, "You're saying if I want to increase my motivation, have more motivation, then I need to think about how hard it's

going to be, all the ways that I'm going to fail? How is that going to jazz me up? How's that going to help me get through when things get hard?" But it does because it's like coming up with a plan B, a plan C, plan D, in advance of actually experiencing that. If you were on a boat and the boat started to sink, that's not the time you want to start looking for life jackets. You already want to know where one is so you can go to it right away. And it's the same thing with goal setting, is that you want to know, "What am I working towards? How am I going to get there? And if I experience this obstacle, here's what I'm going to do about it." You may never experience that obstacle, but if you do, you're probably going to be shy on time, thin on resources, maybe experiencing an anxiety that hijacks your brain so you're not functioning at that optimal level of judgment and decision making. You want to already have the snap next step in place so you can just hop to it, right? We're not going to do our best thinking when we're in crisis mode, but we don't have to if we have already used our resources in advance to come up with that plan B or that plan C. Michael Phelps, incredible athlete, right? This is something that he and his coach have routinely incorporated into their training. So I love this story that, back in 2008, he was hot for the first time on the international stage. It was the Beijing Olympics, Michael Phelps was on the brink of doing something that no one else in the history of the Olympic Games has ever done, which was win eight gold medals in a single Olympiad. At the time of this story, he had already won seven and he had just the 200 fly in front of him before he could do what no one else has ever done, win the eighth gold medal. And the fly is his thing, right? This should've been easy, a no-brainer, he's going to win this, he's going to break Olympic history. As soon as he dove into the pool, his goggles started to leak. And by the time he had done three lengths of the pool, he just had to flip around and come back to the starting line slash finish line, back to the edge. By the time that happened, his goggles were completely filled with water and he was swimming blind. I would've panicked, I would've sunk to the bottom of the pool, I wouldn't have even been in the pool to be honest, I'm not a swimmer, definitely not going to be in the Olympics, but for him, he didn't, it wasn't a moment of panic, like it probably would've been for nearly every other person in that situation, because he had foreshadowed that kind of possible failure. He had imagined that obstacle hitting him in advance, and not even just imagined it, but practiced it, "What will we do?" He routinely practiced swimming with his goggles not fully secured on his face, his coach notoriously would rip the goggles off of his head, smash 'em on the ground for maybe dramatic effect or something, so that he didn't even have any goggles possible to grab as he's in

practice. So because he had foreshadowed that possibility and the solution, "If my goggles start to leak, then I will do," in his case, "start counting my strokes, then I'll make it through." He knew exactly how many strokes it would take from him to get from one end of the pool to the other, he started counting his strokes. He won that race, the 200 fly, he won his eighth gold medal and he'd go on to win 15 more in his career. So we might not all be swimmers, we might not all aspire to Olympic-level performance, but I love that example because I think it helps sort of demystify or give us an alternative perspective on the importance and the motivational reasons why thinking about obstacles in advance, thinking about the ways, the two, three, four ways that your plan might go awry is actually effective at helping us to overcome the obstacle

00:46:38 Vision is Unique, Challenging the Visual System, Realistic Goals & Micro-Goals

that might otherwise lead us to throw in the towel. - That's a beautiful example. I'm going to springboard off that example to ask a question that has also been on my mind, which is, is there really anything special about vision? Because in the example you just gave, it was indeed vision that Michael Phelps was deprived of and it was counting strokes. Counting is another form of incremental measurement, in the nervous system, obviously. There are others, they could be the sensation of the hands smacking the water or breaking the surface of the water, so there are any number of different variables or metrics that one could use. I could imagine that setting out on a, let's say, a three-mile run, which, for me, is a decent-distanced run, it's one I do a few times a week, I'm also not a runner, but I try and complete some runs a few times a week, at very slow pace, just for my health. [Emily laughing] I could count every step, that would be kind of exhausting, but if I knew that three miles was, I'm going to estimate here, I don't know, a couple thousand steps, I could count backward, I could count forward, I could count every 10. I confess, I spend every morning trying to find sunlight to get sun in my eyes to set my circadian rhythm, and I do 100 jumping jacks. So I'm the guy that people are looking at strange on the street. [Emily laughing] But sometimes I count every 10, sometimes I count backwards, sometimes I count forward. Is there any indication that it matters or is it simply that we attach some sort of meaning to that increment and the mode of reaching that increment? Because it does seem like there's something special about vision, and we could maybe dive into a little bit more why that is, but at a very

basic level, how broadly or finally should one set the increments, and does it matter if you're counting steps or counting strokes, maybe it's every other song, you're going to listen to an entire album. That's something that I don't know if people do anymore. [Emily laughing] Or you're going to listen to a whole playlist, and then listen to it again, and you're going to run as long as the playlist is completed twice, you can obviously see what I'm getting at, but I know people are going to want to implement these tools. And I have to guess that the nervous system is somewhat indiscriminent when it comes to these things, but that there might also be some specificity. - I think vision is special, and I think you do too, and for a variety of reasons. When you start, you can really nerd out on how cool the brain is and how cool vision is within the brain. And when you do, then you start to find some things that make vision unique, right? More real estate, more neurological cortex real estate is taken up by the visual sense than any other sense, more than taste, touch, smell, right? Vision gets more real estate, gets more neurological processing space than any other sense, why is that? Well, because evolution has led us to prioritize the visual experience. There's some cool illusions where maybe somebody's mouth is doing something different than what you're hearing, when people sort of create these weird tricks that might go on YouTube and go viral, and people are trying to figure out, "What did I hear? What did I see his mouth doing?" And what comes up is that people prioritize what they see over what they're hearing when the two are incompatible or kind of out of sync. - Every time. - Yeah, every time, right? If you have to bet on it, bet on what it is that you're looking at rather than what you're seeing. And why is that? Well, [sighing] I guess, a couple other things too, right? We can see super far, you can see a flickering candle on a horizon if it was a totally clear sky several miles away. You can see the International Space Station floating up in the night sky, right? Hundreds of miles away, our eyes are amazing. And we prioritize what we see, and I think that's because we never, we rarely [laughing] get the experience of having our visual experience second guessed. Oftentimes, we're having a conversation maybe in a loud restaurant and we know that we didn't hear the person, right? And so we say like, "Oh, did you say that?" Or like, "Oh, I thought you said this," and they're like, "No, I didn't say that," right? So people will correct us when our ears get it wrong, or we're tasting something amazing and we can't quite figure out what spices were in here, and so we know that our tongue isn't quite picking up the taste the right way, and that's why we read the menu to see what are the ingredients or we ask the chef, like, "What did you put in this? It tastes amazing." So we know that our tongue is getting it wrong, or you might be touching

something and you look at the tag to see what sort of textile was used in this really amazing piece of clothing that you're looking to buy. So we know that our sense of touch isn't quite getting it right. But rarely do we have that experience of having our eyes get updated, where we're looking at something, "Oh, I think I'm looking at my mom. Oh, no, actually, it was actually my husband." Okay, that never happens, [laughing] right? That we have gotten vision as wrong as we might get any other thing that we're experiencing through any other sense. We trust our visual experience, we have a sort of a naive realism that what we see reflects the world the way it actually is, because it's never really fully tested, we never get the input or the feedback that you've seen something wrong, until a visual illusion pops up on social media, right? Like the dress example, or the last week or so, there's been that horse-seal-lion drawing that's been all over social media too, "What do you see?" "I see a horse," someone says, "I see a seal," and then chaos erupts, or, "I thought the dress was blue," "No, I thought it was gold." I don't remember the options 'cause I see it as blue, so, [laughing] right? [Andrew laughing] And it's dividing up families and friendships because you've seen something that the other person just literally cannot see. And that's why we love those examples when they pop up in social media when they do, is because it defies all of our previous expectations. If this interests you, there's a really amazing visual artist, Anish Kapoor, who plays with these ideas too, and his installations are just fascinating. I saw one at a museum once, where I walked down this long hall and it's just a big black rectangle that's painted on the wall. And I was like, "This guy's super famous, what the hell? It's just a big black rectangle painted on the wall. What is this about, what a hoax? [laughing] This museum paid how much, what?" or whatever. But then as you get closer, you get closer, and your eyes start to settle in and they adapt to the different visual lighting, you realize it's not a black square painted on the wall, it's a huge hole he's carved into the wall, and there is a whole other world that's back behind there that you can't see right away, until your eyes adapt to the different lighting conditions. - Beautiful. - It's amazing, yeah. - As a vision scientist, I have to see, where is this exhibit? - It's not up right now, there was a retrospective several years ago that was done in Sydney, but his work is all over the place. - Great. - So Anish Kapoor, definitely worth looking up, because, like the dress example, or the horse-seal-lion drawing, or artists like Anish Kapoor's work, that is a moment that gives us a different unexpected insight about the world. That it challenges us to see something that we hadn't seen before, or it induces, or tricks us into seeing something that we wouldn't have otherwise have seen. And so it's those rare moments

that I think are actually really important for understanding what do our eyes normally do? Because we wouldn't find these examples so surprising, so engaging, so shocking, if we had routinely gotten the experience of realizing we're not seeing the world the way that it is. So that is why I think vision is special, and why it can be thought of as a tool that we can add to our toolkit for how to better accomplish our goals. I'm not saying that we should just only focus on imagining the world through an attentional spotlight, but maybe that's something that we can employ strategically on occasion when we think it's going to best help us, when we need an extra little push to cross that literal or metaphorical finish line, but it doesn't have to be the only tactic that we use, just like it's not bad to use vision boards, but let's use something else also. It's not bad to talk to ourselves in encouraging ways, but let's try adding another tool to our tool belt in case that's not enough to get the job done. So I do think that there's great power in thinking about our visual experience alongside other tactics that we might use for meeting our goals. And another one of those tactics might be like the numerics that you're talking about, "Do I think about my jumping jacks in terms of groups of 10 or as a set of 100?" You do it routinely, so you might be able to set a goal of 100 and have that sustain you through number 60, number 70, when maybe it's starting to get harder, but for somebody who's just starting out and wants to be able to make it to 100, that's probably not going to work, that could be quite challenging for them if it's the first time that they're trying it. And so instead, setting those micro goals of groups of 10 is going to be useful, because as we start to get to number eight or nine, or number 88 or 89, and it's really getting hard, we need that extra little hedonic hit of pleasure of accomplishment, the micro dopamine rush that you might get by hitting another decade milestone, another group-of-10 milestone. And once we get that little hit of pleasure, excitement or self-congratulations, that might be enough to sustain us through the next challenging physical obstacle, the next group of 10 that we might experience. So there isn't any prescription that I would give and say, "Every person should decide that 25 jumping jacks is the goal." No, we have to be idiosyncratic and introspect about, "Where are we at with this goal, this thing that I'm trying to accomplish?" and set those goals realistically, but inspirationally as well. We want to set a goal that will challenge us, but isn't impossible. We don't want to set goals that are too easy, because we're not going to trick ourselves into feeling so great about doing one jumping jack, okay? Great, I'm pretty sure most people, if that's a goal, they can do one, so are you going to feel so great when you hit that goal? No, because it was too easy, you didn't have any doubt that you could do that one, but what about 25?

Okay, yeah, I might feel pretty good about that. Well, what about the next group of 25 and now I'm at 50? Those are goals that might seem just beyond the brink of what's possible, but I will feel good when I hit that, and that's going to give me the next sort of boost of energy that I'm going to need to go a little bit further, either that time or the next time. - Yeah, I think vision is special, again, I'm strongly biased here. The reason I initially learned about your work was, well, now you have this amazing book, but at the time, there wasn't the book, there were just the scientific papers,

00:57:12 Do Fit People View the World Differently?, States of Body & Visual Experiences

and of course, upon which the book rests, and those papers are really important, but was the relationship between vision and obviously is our sense of space, but how the sense of space and time are related. And to make the idea quite simple for those listening, when you narrow your visual window, you're measuring, the time bin also gets smaller, right? Which makes sense when you hear it, whereas if you take on a huge visual landscape, you're actually carving up time differently. It's sort of like moving from a slow frame rate to a fine frame rate, slow-motion camera is actually taking a lot more snapshots, right? So you're measuring distance over time more finely. And so, whereas strobe would be the other example, which a strobe is very low frequency, so you're going here, here, here, as opposed to slow motion, right? Strobe gives a course view into the time domain and high-speed photography gives a fine view into the time domain. So I'm almost certain, without any knowledge of underlying data, but knowledge of the mechanism, that I'm almost certain, if not certain, that by placing a narrow visual aperture, we change the way we perceive time. Now, I have a question, and to be honest, I know the answer in advance, but I'd love for you to tell us a bit about how some of this works still further in reverse, meaning how unfit people view the world versus how fit people view the world, or how unmotivated people visually see the world, as opposed to highly motivated people. You talked about these elite runners, you gave them Michael Phelps's example, but maybe you could describe that study, I think it's a particularly important one, mostly because, yes, it identifies perhaps the physiological or psychological differences between motivated and unmotivated, or fit and unfit people, but it also provides a path to remedy that. - Mm-hmm, yeah, out of my lab, but also out of several other labs, there's been work looking at that relation between states of the

body and visual experiences. They haven't necessarily tried to integrate the motivation science element to it, but they were looking to see do visual experiences change as a function of different states of our body? So they've looked at people who experience chronic fatigue, the elderly, people who are overweight, those that are wearing heavy backpacks, and so who are sort of put into that experience of being overweight, what happens to their perceptions of the environment? Well, what they find is that distances look further to those that are overweight, chronically tired, older rather than younger, weighted down with extra baggage, distances look farther and hills look steeper. We've done some of those studies too, where we try to give people more energy, or deprive them of energy, and see does that change their perception of space. And we did that by sort of a classic technique of a double-blind study where the participant doesn't really know what they're experiencing. - I thought you were going to say, "A double espresso." - Oh. [laughing] That is also a good psychological experience to give people. Yeah, so a double-blind experiment where the participant doesn't really know the full extent of what they're doing or what they're experiencing, and the researcher who's interacting with them also doesn't. They do this a lot in medical studies, you give somebody a drug and you give somebody a placebo, a sugar pill, and then importantly, nobody really knows who's got what until you've analyzed all the data and the results are revealed that these are the people that had the drug, the active agent, same idea in the psychological research. In this case, what we did was give people Kool-Aid to drink. And for some people, that Kool-Aid was sweetened with sugar, an actual caloric entity, it could give them energy. Other people drank Kool-Aid sweetened with Splenda. So, yeah, it's sweet, but it actually doesn't have any caloric value, you're not giving people energy, you're just giving them that experience of sweetness. Now, some people, of course, are really good at identifying what's real sugar and what's Splenda, but when you put it into Kool-Aid, a pretty noxious powder, it actually masked it for everybody and nobody had any idea. - 'Cause it tasted like garbage to everybody. - It tastes like garbage, yeah. [laughing] - Sorry, Kool-Aid. I mean, I'm sure there are many people that love Kool-Aid, I guess the sales of Kool-Aid will reveal the data. - [laughing] Yeah, I grew up in Nebraska actually, where Kool-Aid is from, it originated in Nebraska. - Oh. - So I do feel like I'm betraying my roots slightly by casting some shade on Kool-Aid, but that's how it worked, is that we asked them to guess what they got, we tested them afterwards and they were wrong. So nobody's able to guess with accuracy, "What was your drink sweetened with?" Which is important because they were blind, the way that scientists use it, they didn't know what it

was that they were drinking. We give them about 10 to 15 minutes for that sugar to metabolize, and we measured their circulating blood glucose levels to make sure that we had, in fact, given their body circulating glucose, energy that they might use in the next activity. And the researcher, again, didn't know whether they had just served sugar or Splenda, then we asked people to estimate distance. So we gave some people more energy, or we kept others sort of at whatever their normal level was, and what we found is that those people who didn't even know it but who had been given more energy by drinking Kool-Aid sweetened with sugar, perceived their space as more constricted, that visual illusion of proximity was induced, they felt that their finish line, again, in the context of an exercise task, was closer to them. So in just the same way that these other physiology labs, vision science, physiology labs, found that people who are chronically tired, who don't feel like they have as much energy, or those that are physically weighted down and for whom moving within an environment is more costly, we could create that experience for people. We did an experimental version of that, that if you have more energy, the world looks easier, the distances to a finish line don't look as far. So that was some of the experimental evidence that we had to show that people's states of their body do impact their visual experience. Now, I'm a motivation researcher, so for me, the big question is, well, what's the point of that study then, besides just showing this connection between the body and the eyes and the visual experience? We think that that's fundamental to one of the reasons that people experience difficulty when they're exercising, when it's really harder for your body, because of its physical state, to move within a space, you might say like, "Well, why don't they just go exercise?" Because the world looks harder to them, because that distance that they're supposed to walk because a doctor tells them to, or that a partner encourages them to, or a hill that they should hike up because someone told them that would be good for their health, it looks more challenging to them than it does to somebody who's in better physical health. Now, if it looks that way, if it looks harder, if it feels like it might be harder, then psychologically, we know that it is. When you have set yourself up, psychologically, mentally, for that kind of failure experience, like, "I don't know that I have the resources to get this job, this looks really hard," you're already motivationally in a place for this task to be closer to impossible for you. So to put it all together then, what we know is that people whose bodies might make it more challenging for them to exercise are seeing the world in a more challenging way and that is having these downstream motivational and psychological effects that makes it less likely for them to try to take on the task in the first

place or to experience it as harder than other people would or do. - Is the solution the same, however? Meaning, if these people are taught to adjust their visual goal line or to set a visual spotlight on an intermediate goal, can they overcome some of this challenge that they face simply by virtue of their skewed perception? - Yes, so in all of the studies that we have done, looking at that connection between this narrowed focus of attention and improvements in exercise, we do not find that it only works for the people who are in shape or that it backfires for people who are out of shape, it works for everybody. This is a strategy that everybody can adopt, because it's just simply about like, "What do you allocate attentional resources to? What do you sort of ignore, and what do you focus on?" And that visually induces the same kind of illusion for everybody, regardless of whether you're overweight, or you're at your target weight, or if you're struggling to get there, or you've already accomplished where you want to be,

01:05:54 Caffeine, Stimulants, Visual Windows & Motivation

that visual illusion can be induced for everybody and it has the same kinds of consequences. - Terrific, earlier I made a joke about double espresso, but now I'll make a serious statement about double espresso, which is that it contains caffeine and caffeine as a stimulant, like all other stimulants, cause a change in our visual world. The most salient one is the one that police officers look for, or parents suspecting that their kids have ingested substances of any kind look for, which is if somebody's pupils are unusually large for a given visual environment, that is an indication of high levels of autonomic arousal. In the street drug translation of this, people who take amphetamine or cocaine will have very big pupils. People who are very relaxed have small pupils. However, everyone should know that pupil size also is dynamically regulated by how bright a visual environment, so there are multiple things controlling pupil size. However, we know that when we are very stressed or very aroused in any way, positive or negative, the pupils get big, but within the visual system, what that equates to is a narrowing of the visual aperture. So rather than ingesting sugar, which I'm guessing most of the world, certainly the US needs to ingest less sugar, at least that's what we're hearing. I'm sure there are a few sugar sucro-nistas out there, sucrose-anistas. [Emily laughing] Who will also come after me with pitchforks, but let's face it, most people will probably be better off ingesting less simple sugar, but caffeine is a great motivator because of the internal sense of arousal, but it also narrows our visual window. I could

imagine using healthy amounts of caffeine combined with maybe even blinders of the sort that horses wear, maybe like a hoodie and a hat. [Emily laughing] Maybe even blinders in order to get over some of those more challenging milestones. Is there any evidence that people are doing this without, well, obviously people are doing it without knowledge of how it works, but are there any studies looking at how adrenaline, or epinephrine, or any other stimulants impact motivation? - I don't know, honestly, yeah. - [Andrew] And energy drinks are a big thing now. - Yeah, yeah, for sure, they are, and if you actually are more physiologically aroused, or jazzed, or whatever, amped up, or you just think you are, in our studies, we have found that they work in the same way, that it can produce the same kinds of consequences. And I like that because it tells us you can actually change the state of your body to induce these kinds of experiences, or you can just think that, [laughing] you can trick yourself, you can placebo effect yourself out and produce the same kinds of effects. I had to give up coffee like 12 years ago, and not for any. - I'm so sorry. - I love the taste, [laughing] and so decaf is my jam, but I can't drink the caffeine, because it didn't actually do the thing that it does for so many other people, like make me feel more energized and more awake, I just got sweaty and jittery and anxious and I couldn't focus. - Yeah, some people who already have a fairly high baseline level of attention and motivation, they find that it puts the autonomic seesaw too far in the sympathetic tone. - Yeah. - Yeah. - And I happened to marry the same kind of person, he also can't drink caffeine, but loves the taste of coffee. The interesting thing is that we both have to have coffee in the morning to feel like we're ready to go for the day. So it's just part of our routine [laughing] or whatever, to have that taste and have that sensation to feel like I'm ready to take on the day, even though, I mean, yeah, decaf still has some caffeine in it, but we're not drinking that much of it to probably actually create a caffeinated experience in our body, but we're tricking ourselves psychologically into doing that thing that, in years past, used to work for us both. So I think that's something to keep in mind, like you might have a hoodie that you can wear to induce that visual illusion, or you can take advantage of the power of your mind. At the end of the day, I'm a psychologist, and I believe that we have some non-zero power over what our mind is doing, what we're thinking about, what we allocate our attention to, that can do the same kind of thing that a hoodie might do or that a cup of caffeine might do. - Mm-hmm, I completely agree, the visual aperture is under our conscious control. That's an amazing feature of our visual system, we can narrow or expand it. Takes a little bit of practice, I think, for people to learn how to do this without moving their head around to expand their

visual aperture and how to narrow it, but what I always tell people is, "Just imagine a really troubling text message or a really exciting text message coming in, all of a sudden, you forget about the world around you."

01:10:13 Tools: Goal Setting & Cognitive (Non-Physical) Goals, Data Collection

So it can be triggered by these outside events and we can learn how to anchor our visual attention. I'd love to ask about other kinds of goals, meaning non-physical goals, because many people are trying to read more, I would hope, or learn music, or a language, or things that really involve cognitive goal lines or internal goal lines. Reading one chapter out of a book each night is a tangible goal, the other that I've often wondered about are these systems that allow you to highlight individual lines or even words on a page, that's very visual obviously, and everything else is ruled out except that word, I've always wished for books that would naturally highlight each page. And as I say that, someone will put in the comments, this has probably existed for 10 years. [Emily laughing] And I'm just showing what Luddite I am, but is there any example or tactic that people could use to better approach cognitive goals, of school, work, recreational too, but that don't exist in the kind of fitness and sports domain? - Totally, yeah, so just to shout out to my brother-in-law, who has done some of that research, where it does highlight different parts of words in paragraphs, and he's found it to be an effective way for English-as-a-second-language learners to pick it up, that that is, that tying that vision to the process of learning language is effective. And so there's a whole cool body of work and researchers looking at that, so you're right about that. - If you want to mention what he does, is there a place that people can learn more about that? We can provide links if. - Yeah, let me. Yeah, yeah. [laughing] - Okay, we will provide links to those resources, 'cause I want those resources. - Yeah, yeah. - I've been trying to learn a second language for a long time. - Yeah, cool. - I speak Spanish pretty weakly, but I would love to get better at it. - Oh, yeah. - Okay, I'll approach you later about that. - My five-year-old son speaks Spanish better than I do at this point, so yeah. [laughing] - And clearly, better than I do too, thank you. [laughing] - Yeah, yeah, yeah, so I was thinking that too, we started this work within the context of exercise, but of course, that's not people's only goal that they have in life, and it isn't mine either, I have interests outside of improving my exercise game. A couple years ago, when I was writing the book, I also had a child, the same month that I had the opportunity to pull all this

research together is the same month that my son came to be. And I started to realize I became a lot less interesting once he was around, he was fascinating, but I was changing diapers and feeding him and that was it. People would come over, be like, "What's up? How have you been? Tell me something that's going on in your life," and all I had to talk about was what was boring? And I just felt like, "I've lost myself," I used to pride myself on crazy adventures and problems I would get myself in and I was a great storyteller, and that, all of a sudden, disappeared as soon as he came into the world, because he became my world. So then I started thinking, like, "I need to pull back some coolness, if I ever had it in the first place, but I need to be a cooler person than I'm coming across right now," so I decided, "I want to learn to play drums, and I want to be a one-hit wonder as a rockstar drummer. I only want one song, 'cause I know I'm not going to be able to do more than that." I'm not coordinated at all, from the beginning of time, in fifth grade, I have this really vivid flash bulb memory of playing basketball for the very first time, I lost my footing, I knocked into my own teammate, pushed her out of bounds while she had the ball, we lost the game and I was not invited back [laughing] on the team for the next season. And so that fomented my self-definition of uncoordinated. I am a musician, but I am not a drummer, and the idea of coordinating four limbs in real time was like, "If I could do that, I would be so proud." So that's a goal that I set for myself, at the same time that my son came into this world, when I was also trying to think about goal setting and how to improve my ability and all of our ability to get a job done when you're faced with some pretty big obstacles. So I got to practice all these techniques that we're talking about on myself and see for myself, when I tell people, "Hey, try this thing, narrowed focus of attention, does it help with something like becoming a better drummer?" And the answer is yeah, these tactics at least work for me, sometimes, under some circumstances, and they do for other people who try them for other goals that aren't necessarily about exercise. One that I found particularly helpful was overcoming my bad memory, that everybody's memories are faulty, right? Everybody has sort of a warped perception of the past, it might be skewed more positively than maybe we deserve, or it might be skewed more negatively if you feel that what looms large in your mind, as you reflect on something from the past, or the mistakes that you've made, or the social faux pas that you had, or challenges that you faced at work when you got in trouble with a boss or with a colleague, if that's what really stands out in your mind, or the good side of all of those possibilities, we probably aren't getting the world right. And that is something that our brain has evolved, to give us a faulty memory, to level and

sharpen, to not encode and remember and be able to recall everything that we've experienced with accuracy and precision. And that's a problem when it comes to assessing our own goal progress. When we want to be our own accountant and try to determine, "How are we doing? If I want to become a drummer, am I on track for getting there before X, before my time runs out? Am I going to make it or not?" And I think that's an experience, whether they want to be a drummer or not, that a lot of people can resonate with, of trying to determine, "Is this trajectory, is this rate of progress going to get the job done by X amount of time? Will I have my swimsuit body by summer?" Or, "Will I save enough for retirement by the time I hit 65?" For these goals where time is involved and there is a deadline, we do take moments to assess our trajectory. And if we just rely on our memory, we're probably going to do a bad job of assessing that trajectory, of knowing whether we're on pace to meeting our deadline. And I found that to be the case as I was thinking about, "Am I actually going to be able to learn this song? I mean, I know that it's going a lot slower than it probably would for anybody else, but to give myself a deadline and a commitment." I decided I was going to put on a show, I was going to invite everybody I knew and also people I didn't know, and I was going to play my one song for them, so. - This was while writing a book and having just had a child. - Yeah, yeah. - Yeah. - So when you read the book, you'll see my story, and it's the real truth of it. I mean, I did play that show and it was fine. And then, because I wrote about it in the book, then some other opportunities to play it publicly have come up. And it's like, "All right, I told people I can play drums, I better show them that I actually still can play this song." - [Andrew] I love it. - Yeah, so that that's been fun. I have become a one-hit wonder, if you ask me to play the song, like, "Encore," it's just going to get that same song a second time, so literally one-hit wonder. But so in the process of figuring out, "Am I going to be able to play this show? I sent out invitations, the date is committed, people are coming to listen to my one song, God bless them, how's it going to go?" And it felt awful, it just felt like, "I am not making progress here," because there's a lot more things that actually are pressing, right? Like the kid does need to get fed, I do have to go to my day job, the editor is asking for the next draft of this book, and that is going to take precedence, like it does for so many people, that things command your bandwidth, even when you have this goal that you've committed to and that you've got on the books. And so I just felt this looming anxiety about this goal that would require, didn't have to be daily practice, but you can't cram that kind of a goal, it does take committed investment for a sustained period of time. And so I had this looming anxiety that I'm not making

good enough progress, but that's because I was relying on my memory and my brain to recall, like, "How many times did you practice? What was it like the last time you practiced? What was it like when you tried to play this bit or this riff like two weeks ago, have you gotten any better since then?" And it just felt like, "No, I haven't practiced enough. I don't remember when the last time I played was, but it definitely doesn't feel like I'm getting any better." Then I thought, "You know what? I should stop relying on my brain to tell me, where am I at and am I on an upward slope here? I need to look at the data." I love data, scientists love data, so I started to collect data on myself. What I did was download this app that a friend had told me about called the Reporter App, there's lots of these kinds of things out there. Basically, it just sets up your phone to randomly ping you with whatever questions you want your phone to ask. It records your answers, you can download the data, you can make pretty graphs to see, "What's my change and how I've answered these questions over time?" So I did that for a month, for a month, I had my phone ask me a couple of times a day, well, maybe twice a day really, "Did you practice, since last time I asked you," my phone says, "did you practice?" Mostly it was no, and if yes, then it would funnel a couple of other questions, like, "How did you do, how do you feel? Check a couple of different emotion words now about your experience when you played." And I did that for a month, after a month, went into my office, downloaded the data, and first took stock before I looked at the numbers, like, "How do I think I did over the last month?" And I thought, "Same as every other month, I didn't really get anywhere. Yeah, I practiced, but I still feel awful." And I cried, I cried having to practice. I was upset with myself for setting this goal and feeling so anxious about it. All I remember is that I cried, cried too much about this personal conquest that wouldn't matter to anybody else. Honestly, it really doesn't matter in the scope of things anyway, I'm not going to become a drummer professionally, so who cares if I embarrass myself publicly? But what I found from the data was my memory was totally wrong, I actually had practiced far more times than I remembered, and when I looked at my emotion words that I used, it was a clear upward trajectory. Yeah, I did cry, that part I hadn't misremembered or made up, but by the end of that month, I had gotten a compliment from my husband, who actually is a drummer, and said like, "Hey, that wasn't that bad." And then there was one expletive, "You were effing amazing [laughing] at that one thing you'd been practicing at." But like, "Okay, fine, he's my husband, right, is he just?" So at the moment, it didn't really feel that great, and I downplayed it, and as a result, it didn't stick in my brain, right? I remember how stupid it felt that I cried because I can't make

progress, and I downplayed in my mind the thing that actually should've been a legitimate indicator that progress was being made. So all of which is to say, I needed to collect that data on myself and to look at it objectively, accurately and completely, because my brain wasn't doing that for me. That visual experience [laughing] of downloading that data and looking at what was my actual experience gave me better insight as I was trying to assess the trajectory of my progress, I became a more accurate accountant of my own progress, which is important for setting goals or resetting them when you need to calibrate in light of what's left to do and how much time do you have to do it in? - I love it, so basically, if I understand correctly, when the intermediate goals of say daily practice, or twice-a-day practice, or reading, or math, et cetera, are not a visual goal line, it really does help to visualize some aspect related to that non-visual goal line, in this case, the Reporter App was a useful tool. I've never heard of it, I plan to use it, I'm sure a number of people will be interested in it, sounds like there are others out there,

01:21:54 Year in Review & Memory

but that's the one that you found most useful? - Yeah, yeah, there's another one too that is even more visual than that, [laughing] than the Reporter App, although that has visual components and is really effective if you like data and want to collect numbers on yourself or your experience, there's another one called the 1 Second Everyday app. This is really awesome because the app is a mechanism to record one second of your life. There's such an awesome community of people that just live by this and love having these experiences, and the creator of it I got to a chance to talk with, and he has done this, he's taken a one-second video of some aspect of his life, every day, for, I don't know, 12 years, 13 years or something. - One second? - Yeah, one second. And then what the app does is smash 'em together and give you a chronology of what your year, or your month, or your last decade of life has been like, and presents it as like a streamlined video for you. So you just see these flashes of your life over however long you tell the app to create a montage for you. And so when you see these videos that people have made, especially those that have been doing it for a really long time, it's fascinating. I did that for myself too, I tried it, one second of today's drumming performance, another second, it's not enough to capture, "Am I actually doing a good job of drumming?" or, "What's my trajectory for drumming?" But the guy who made it says one of the most awesome one-second videos that he ever made is of a brick wall. I was

like, "Well, you didn't need a video of that, what's the wall doing?" It's not crumbling, it's not in earthquake land or something like that, it's just slightly jittery, one second of a brick wall. And I was like, "How is that motivating or exciting to you, why is that? You've been doing this for 13 years every day, one second, why is that the one second that matters to you most?" And he says, "Because when it comes up in my montage, it reminds me of a really horrific moment in my family. That was the first wall that I saw when I walked out of the room having heard that my sister-in-law had this awful, awful experience, her intestines started to twist up on themselves and knot up, and she was on the brink of death. And we had just found this out, she had just gotten into the hospital, they diagnosed this issue that required immediate surgery. And our family was there to hear about this, and we were all stunned that she might die, like, 'Right now, she might die.' And that's the first thing that I saw, and it reminds me of how precious life is, how important family is and how the rest of whatever we were doing that day didn't matter, because we all needed to be here together right now." And that is all of this emotion and purpose in life is conjured up or reminded when he looks at one second of a brick wall as it pops into his video feed. So if you're visually oriented and you do want ways to remember, "What was life like, what has my year in review, what does it look like?" that's an awesome app, 1 second Everyday, that can help you do that. - These are great recommendations. And a couple of reflections, first of all, the brick wall example is a beautiful way of highlighting this other feature of the visual system, which is that the brain largely thinks in symbols, it's very efficient, it batches entire experiences into symbols, and in this case, the brick wall can be attached to a whole set of experiences that are very meaningful to this individual, that brick walls don't mean that, or didn't mean that to me until hearing this. So I think that it highlights the fact that the actual symbol is less relevant than what we attach to that symbol, but that symbols are so efficient that even in a one-second view of something, we can attach to it, for better or for worse. The other is that I'm a absolute, almost rabid proponent of people getting morning sunlight in their eyes as the fundamental layer of setting their circadian rhythms and sleep and health as a zero-cost practice, that believe it or not, can be done any time of year, or anywhere. [Emily laughing] But it does take a little bit of effort, you have to get outside, you can't do it through a window or a windshield for it to be efficient, but it has huge outsize effects on human health, this has now been demonstrated again and again and again. And so I'm going to just do a sort of call to action, if people aren't already doing this, I'm going to start using the 1 Second app to record my morning sunlight viewing,

and prove that even through cloud cover, you're getting more photons than you are indoors and that it's worthwhile. I also would love to do this for my next dog, to go from puppy to full-size dog, and maybe even to the end, who knows? Great, these are wonderful tools, you've given us a huge number of practical tools, which, frankly, isn't always the case on these podcasts. We always strive to do science and science-based tools as our kind of mantra,

01:26:32 Visual Tools & Mental Health, Depression & Visual Priming

but you've given a rich set of tools here to apply. I just want to briefly backtrack to something, and then a final question. Earlier, we were talking about how unfit people see the world as more challenging, maybe even hills as steeper, distances as further, and how shifting people into a state of energy, either cognitively or through the ingestion of real glucose to get an energetic lift, or maybe through caffeine if that's within their practice and span of healthy behaviors, they could do that. There's so many people who are suffering from depression, which one of the key features of depression is a lack of energy, even though there can be an anxiety associated with depression, I have to wonder whether or not some of these tools are being deployed or will be deployed in the context of mental health, because depression is this vicious loop, right? People feel a lack of energy and hopelessness, and then things just look harder, and so then it just verifies their negative worldview and it's a downward spiral. That's why medication, in some cases, and social sport, et cetera, can be helpful, because they feel more energized, the side effects, often, are a problem, however. Have there been any efforts to implement some of these visual tools to create this increase in systolic blood pressure and a kind of readiness and willingness to lean into what people perceive as immense challenge? And if not, for anyone listening, I know we have a lot of listeners in the mental health space and in the helping space, so to speak, I can imagine these are zero cost, right? We all provide, with people that are sighted, have the apparati to do it. Are you aware of any studies like this or is your laboratory involved in any studies? 'Cause I just see an immense value of implementing the sorts of tools that you've developed. - Yeah, we haven't explored those ideas directly. So call to all the scientists that are out there, there's a great opportunity to start looking at these tools within the mental health space, you're right. Other researchers though have, not this use of inducing a narrowed attentional focus and can they now feel more energized to go for a run? But they have

looked at the relationship between anxiety, depression and visual experience, and found, over decades, evidence that people with depression or with anxiety, what their attention is captured by within the bigger global surrounding world are those things that are negative or reinforcing of their worldview. Now, that happens for everybody, that things that are on our mind tend to pop out, [laughing] that whatever we're thinking about, we might start seeing some version of it showing up in the world around us that captures our attention. That's an idea called priming, what we're thinking about might then lead us to attend to the world, to see things in a way that aligns with what we're already thinking about, it's just that when what we're thinking about are those depressive, ruminative, anxiety, fearful thoughts, when that is what is cognitively accessible, when that's what's going through our mind, then that's also what captures our visual gaze. So when we think like, "The world is hard, the world is full of sadness," and that's the thought in our mind, and then we start seeing the people with frowns on their faces or who are experiencing anxiety, and that's what captures our attention, even when there's other people around that might not be seeing the world or experiencing the world that way, it becomes reinforcing. When I think that the world is threatening, and then I notice the threats that are around me, that confirms what I'm thinking, which heightens my anxiety or my fear, and then it further leads me to narrowly focus on those elements of the environment that are aligned with that worldview, it's really hard to get out of that, that's where the vicious cycle can come from. So that has been really well established within the medical community, this selective attention relating to states of mental unwellness, that's been pretty well established. And so there's been some interventions done with people that have depression or anxiety, saying like, "Here's an array, a photograph of a bunch of different faces. Yes, it's artificial, it kind of looks like a page from a yearbook, a high school yearbook, but look for the faces that are smiling, look at the faces that are smiling. Try right now, spend 10 minutes having your eyes focus on those and look at those people," that it is an effective intervention at improving [sighing] people's sense of self-efficacy, of, "What can I accomplish next?" They feel a little bit more energized. It doesn't cure depression, it doesn't cure anxiety. I mean, these are literal physical afflictions that we have, so it's not a quick fix, but it can produce a temporary change that might be a way to start getting out of that rut. - Mm-hmm, yeah, and I think nowadays there's an increasing attention on tools that will help people orient as they start to veer towards suicidal depression, or veer back into a depressive episode, or anxiety episode. I mean, trying to reverse an entire syndrome or set of

syndromes is far more complicated. Likewise, in the health space, just trying to get people to deploy realtime tools

01:31:33 Focusing Attention & Increasing Visual Detail/Resolution

to adjust their anxiety or to exercise more often and so on. As a kind of a final, but also kind of a high-level question, I'm imagining that, and I plan to use this visual goal setting of spotlighting, I've been using it actually for some time on runs, it works really well. Yesterday, I took a run near the waterfront here, and I think I did it somewhat incorrectly, the entire run, I was thinking about getting back to the statue, at which I started. - [laughing] Yeah. - But I did find that I ran fastest in the final 20 meters. - Cool. - Which, admittedly, wasn't fast at all, but it was faster than what preceded it. [Emily laughing] So it works and it makes perfect sense as to how it works. You've done other studies exploring some of the other features of vision, like the luminosity, how bright something is and how people perceive it. That was in a completely different context, but is there a kind of a higher level, a kind of a black belt version of what we're talking about here, where not only am I focusing on a specific visual location as an intermediate or a long-term goal, or I'm using an app to ask me a question and tap into how I'm feeling, create a visual representation of my motivational state, but that I'm also making my phone as bright as possible, I'm also trying to take that visual window and actually pay attention to more of the details at that location? Or is it simply a matter of kind of, in geek speak, visual neuroscience, we would just call this like low spatial frequency, just sort of grabbing a black and white snapshot of something here or there in my mind? If I attach more detail and effort to the specific thing that I'm focused on, is there any evidence that that's more effective? - It certainly changes what our brains are doing, [laughing] so how do we define effectiveness? That's a question for philosophers and that scientists will always debate. - Will it keep me running? - Yeah. [laughing] [Andrew laughing] It will when you use it towards the end of your run, just like you've picked up on. Yeah, so there's cool studies that neuroscientists, not I, not coming from my lab, that neuroscientists have done looking at, "What is it doing to your brain when you've decided that you're going to focus your attention on this element of the world and not pay attention to something else? Is that just sort of tricking your thoughts or is it doing something different, to something more basic, more low level?" And the answer is yes, so there's an area of the brain, the fusiform face area, it's a part of our brain that's really

specialized for making sense of faces. It's important as a social species to pay attention to other people, pay attention to their faces, what they're trying to communicate through their face, and so our brain has developed a really specialized central area for doing that then. And so these neuroscientists will present a face to somebody, but superimposed over that is a house or something else that is less special [laughing] to us as a social human species. And so both of those things, because it's sort of like both images are sort of transparent, overlaid over one another, our eyes are getting both of those images in and our brain is getting both of those images in, but we can will ourselves to focus on the house. "Just really pay attention to the features of the house, even though everything about that face is still there too," or, "Pay attention to the face and just tell me, what is it that you are deciding that you want to hold on to, that you want to look at right now?" And you can see that the brain is responding to that, so when people are saying like, "I'm really seeing that face, the details of the face, 'cause I'm paying attention to the face," even though we know their eyes are also looking at and engaged with the contents of the house that's right there, smacked on top, the fusiform face area lights up. And when they're saying like, "Nah, I'm really focused on the house now," we see activation in the fusiform face area decline and other areas of the brain's neurological real estate start to engage. So yeah, I think there's something to it, that, at a high level, our brains are responding to our psychology as well. And we have that great power to really, with intention, with practice, decide, "How do I want to engage with the world?" And can it produce real change in our bodies and in the way that we experience the world? The answer is yes. - Fantastic, well, you've given us a ton of mechanistic and conceptual and practical information, so I'm speaking for a lot of people when I say thank you for taking the time out of your schedule, amidst kids and running a lab and teaching at the university and your book, which we will point people to and provide a link to, as a wonderful resource,

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and we hope to have you back again. - Thank you so much, it was a great conversation. - Thank you. - Thanks. - Thank you for joining me today for our discussion about motivation, goal seeking and research-supported tools for achieving your goals with Dr. Emily Balcetis. If you're learning from and/or enjoying this podcast, please subscribe to

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