Brett Wingeier: But the fact is everybody at the end of the day wants their brains to work better. Everybody has points in their life where they need to get more from the limited time that they have to learn, or to train, or whatever. We're learning so fast, so much about how this works that five years from now, we're going to know exactly the waveform to deliver that is best for whatever category of stuff you want to learn.

Announcer: Bulletproof Radio, a state of high performance.

Dave Asprey: You are listening to Bulletproof Radio with Dave Asprey. Today's cool fact of the day is that clumps of cells in laboratory Petrie dishes just spontaneously formed brain waves. These little lentil-sized clusters ... By the way, these are lentils without lectins, apparently, of nerve cells. That was a super geeky diet joke, if you didn't get that. You'd have to read The Bulletproof Diet, sorry.

Anyway, these nerve cells are about the size of dumb little beans grown in a lab dish. And they start firing off rhythmic electrical signals, and those oscillations have some of the same features that we have in our developing human brains as babies. These are little three dimensional spheres of human brain cells that are called cerebral organoids, and they're super simplistic models of the human brain.

And in the study, researchers at UC San Diego coaxed stem cells into forming some of the neurons that make up the outer layer of the brain. And that's pretty fascinating neuroscience, but it makes you wonder. At what point does your brain become your brain? In this case, each of these organoids is about a million times smaller than a human brain. It lacks the complex combination of cells that help shape neural waves in people.

They're not miniature brains, but just a model for a brain, but no one can tell you why they started doing that. So there's some questions at the very fundamental nature of consciousness, neuroscience, and human existence. Where do you draw the line? I don't really know, but I also know plants are smart, too, and that's why I eat them.

Today's episode is a special episode recorded live in San Francisco at the headquarters of Halo Neuro, because we're going to talk about electrical stimulation of the brain. I figured what better place to do that? And if you're interested in brains, and performing well, and things like that, you definitely want to check out Super Human, my new book. It is just out there as we're recording the show, and you'll find really, really good value for you. Especially if you realize that one in 10 people are likely to die of Alzheimer's.

And what if there are ways to take care of your brain? What if there are ways to exercise your brain? Well, we're going to talk about some of the things you can do to make your brain stay young. And on my website, DaveAsprey.com, you

can actually see a picture of my brain response time that says that I'm responding with a 20-year-old's speed, even though I'm 46.

Maybe some of the neurostimulation that we're going to talk about today is part of how I do that. Maybe it's just Ping-Pong. Maybe it's mitochondrial enhancement. I don't really know, but you're going to learn a lot of cool stuff in today's episode. And it's really cool to be able to pick the brain of someone who's really looked at engineering and neuroscience, where they come together.

So I'm going to be interviewing the co-creator of Halo Sport, which is the world's first convenient wearable neurostimulator for athletes specifically. You might have seen videos of me doing ladder training, which I'm super not experienced in, with the Halo on my head, and I actually use this thing at home all the time. So with no further ado, I'm going to introduce you to Brett Wingeier, a PhD, CTO, co-founder of Halo, and a guy who's going to blow your mind.

Brett Wingeier: Thanks, Dave, and thanks for coming to Halo. It's really awesome to have you here.

Dave Asprey: I was hoping you would completely freak out when I said you were going to blow my mind, because you're actually running electricity across it.

Brett Wingeier: That's what we're all about.

Dave Asprey: That didn't push any buttons for you?

Brett Wingeier: It didn't push any-

Dave Asprey: I tried.

Brett Wingeier: No triggers here, no triggers. So Dave, what we're going to talk about today is we're going to talk about making brains better, and as you know, that's just about one of the most important things that we could possibly talk about.

Dave Asprey: So we're going to talk about coffee, pretty much? Because that's what I-

Brett Wingeier: So I love coffee. Let's just get that out there.

Dave Asprey: I'm kidding.

Brett Wingeier: I love coffee, so we could talk about coffee for an hour, and that'd be fantastic.

Dave Asprey: That would be my frontline technology for making the brain better, but the reason I wanted to pick your brain today was you know something about learning.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And I know that people who listen to Bulletproof Radio are interested in learning faster, and just spending less time and energy getting stuff done. And since learning is a fact of life we're all doing all the time, what if you can acquire skills faster than normal? So explain to me some of the history of what we know about how we learn, and why you got interested in this in the first place.

Brett Wingeier: Yeah, so brains love to learn, and that's one of these fundamental things. It's neuroplasticity. That's what a brain does is it optimizes itself to get the job done, and the way that's happening under the hood is your brain cells are firing. That's what they do.

They fire together, and they're constantly forming stronger and weaker connections that help them work together in exactly the right networks for exactly the right output. And what do we mean by output? That could mean the perfect backhand. That could mean the perfect Ping-Pong overhead spin shot, or it could mean learning a language. It's all about your brain optimizing itself to get the job done.

Dave Asprey: I had a conversation with my son. He's 10, and he said, "Daddy, what is the fastest way to learn something? Or what is the best teacher?" And I thought about it, and I said, "Gravity." And he said, "What?" And I said, "Because if you fall down, it hurts and you won't do it again." So the point that I was teaching him was, look, avoiding pain is something that we're wired into.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: So it seems like the first thing we learn is don't do things that hurt. Is that different than learning the perfect backhand, forehands, something else? What's going on there.

Brett Wingeier: No, so it's exactly the same mechanism.

Dave Asprey: Okay.

Brett Wingeier: And I hear you, because in raising kids, the guideline is if you're looking at something they're doing, you want to evaluate ... That is going to be just painful enough to be a life lesson, but not bad enough to actually hurt you. So when your brain does something that has a good result, then it activates mechanisms that reinforce those connections. When your brain does something that leads to pain, then it activates mechanisms that make those networks less likely to fire together in the future. So it's the same effect. It's all neuroplasticity.

Dave Asprey: All right. I'm getting the neuroplasticity angle. It's a huge part of Head Strong, my book, was how do I increase my own neuroplasticity? And certainly, one of the technologies is electrical stimulation, but it seems like the ability to acquire

a new language, let's say, is such a far cry from learning how to walk, or learning how to not fall on sharp things, and things like that. At what point does learning stop being about pain avoidance and start becoming something that's more about skill acquisition. And what motivates those neurons to do that? How do we take control of that?

Brett Wingeier: Well, so the cool thing here is that doing something well is so deeply satisfying, and it's wired into us. You know that feeling you have when you execute on that perfect tennis stroke, and that feeling you have if you're learning a language, and you get out there, and you say something right. And you're out there, and it's this enormously pleasurable feeling. And so, that sensation of learning, and doing something well, that's the reward that causes that feedback that reinforces the connections that led to that great outcome.

Dave Asprey: I'm going to go back to pretty much my entire experience in school, and people appeared to want me to learn stuff that I just didn't really care about, and had no usefulness to me whatsoever. And by the way, if you're one of my teachers back then, I'm sorry, but I'm actually right. Most of what you were teaching me wasn't that useful, although I appreciate all of your service, and putting up with my crap. But in all seriousness, I don't really care what year someone did something 500 years ago. All I care about is why they did it, right? But they never taught me the why, they just wanted you to memorize crap.

Brett Wingeier: Right.

Dave Asprey: In your career as an adult or as a teenager, how do you make yourself learn stuff you don't want to learn?

Brett Wingeier: Yeah, and it's hard. It's focus, and one of the brain mechanisms that comes into this is what's called cognitive control, and that is something that we are absolutely better at right now than we were when we were kids. In a lot of ways, our brains are ... It's getting harder to have them do what we want. Neuroplasticity goes down over time, reaction time, all these things. But one thing that we do tend to get better at is cognitive control, because our frontal lobes spent the first 25 years of our lives developing. And cognitive control is your brain's ability to focus on what you want it to focus on instead of necessarily what it wants to focus on, or the view out the window, or whatever.

Dave Asprey: So is this part of that, with age comes wisdom?

Brett Wingeier: Yeah, with age comes wisdom. And again, there's plenty of stuff that does tend to go down as time goes by, but if you look at the [inaudible 00:09:55], working memory decreases, reaction time decreases, ability to pack stuff into short term memory decreases. The one thing that stays constant is knowledge of the world.

That's what we call wisdom, and that's why ... Picture the old silverback gorilla that's still able to keep up, and knows some sneaky tricks to keep the

dominance. That's the silverback gorilla. We're the silverback gorillas here, having this life world knowledge.

Dave Asprey: All right, so our brain performance goes down over time, at least if you don't do something about it. My experience, just from my own measurements ... Let's see, my hippocampal volume is 87th percentile, so it's not shrinking the way it's supposed to shrink.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: As I age, my reaction time on EEG to audio and video visual stimuli is exactly that of a 20-year-old. I get more sleep in, well, last night, five and a half hours than the average 20-year-old gets in eight hours.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And my working memory, I've trained that.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: So it's highly functional, probably better functioning than most 20-year-olds as well.

Brett Wingeier: Yeah.

Dave Asprey: So all of these things are exercisable. They're things you can make the brain do if you have ... Is it cognitive control you have to have in order to do that? Or is it willpower? And some of this training is annoying, or it takes time.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: But what enables people to decide that they're going to push themselves, whether it's physically or mentally, in order to do training on things like that?

Brett Wingeier: Right, so part of it is cognitive control, which I think is just kind of another name for willpower, and the ability to focus. Part of it is relevance. It's always easier to learn something, or train, or practice anything if you feel like it's relevant to what you're doing every day, relevant to some goal that you actually care about.

Dave Asprey: All right. Let's talk about relevance, then. You have more than 50 patents in your name, and so you've been pretty successful in biomedical engineering, but you're also a singer/songwriter.

Brett Wingeier: That's right. That's right.

Dave Asprey: Where's the relevance here? Why do you do both of those things?

Brett Wingeier: I guess there's a couple of answers to that. You know, it's communication, and communication is fun.

Dave Asprey: Yeah.

Brett Wingeier: One thing I realized about myself is, to bring this back to learning, I'm what I call a performing introvert, meaning everything about how to get out there and communicate. There's people that that comes naturally for, and again, I look at my nine year old, and that comes naturally to her. It comes naturally to my wife. For me, it was more of a learned skill.

And part of that was just the enjoyment of the more you get out there, the more you use this, the more fun it is to communicate. And that's what music is for me. I lived in New Orleans for a long time and I did the singer/songwriter thing in the 90s, and played at the bars, and the coffee shops, and everything, and wrote some songs. It's all communication. You give this feeling of kind of putting it out there and connecting with people.

Dave Asprey: So it's the joy of skill acquisition is what drives you to do that.

Brett Wingeier: Yeah, the joy of skill acquisition, and then using that skill. Because when you're writing a song, you're creating something, and there's a whole ton of neuroscience behind that, as well.

Dave Asprey: Oh, yeah.

Brett Wingeier: And the creative process is ... Part of it is where you're generating ideas, and you want to take the filter off. And then part of it is where you're evaluating those ideas, and you're discarding the 99% of those song lyrics that are just crap. And you put the filter on a little bit, and then you come out with that ...

By pairing, taking the filter off, and then putting it back on, you end up with something creative. And then you put that together with the pleasure of learning. Learning the chord progression, learning everything, just being able to put it together, and then execute on it, it's one of the most fun feelings you could possibly have.

Dave Asprey: Do you find that there's a crossover between the physical movement things ... and Halo is known for enhancing the motor cortex with electrical stimulation, so you get better physical skills. But we also know that the brain works better and improves anytime you have more muscles. Anytime you move more, the brain increases function.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: Do you think that the neurostimulation, for what it does for your physical movement also has an effect on your personal singer/songwriter abilities? Is there a crossover?

Brett Wingeier: Yes. Yes is the short answer.

Dave Asprey: And just to be really clear, I'm asking about your experience, not a claim on your product, because you do work for Halo.

Brett Wingeier: Yeah, so personally, there's a couple things there. So one is, as a musician, the more you dial in the technical aspects of what you're doing ... If you're able to grab for that A-5th diminished chord exactly where you want it, and your fingers just know what to do, then you can be free to be creative, and express, and improvise. And then, if you turn to other brain targets, and again, this is from personal experience, the brain is more than just movement. Whether it's neurostimulation, or all these other principles of learning, the same applies to learning the lyrics, and learning how to perform, and all these other things that your brain learns.

Dave Asprey: Do you use neurostimulation every day on yourself?

Brett Wingeier: So I don't use it every day, mostly because I don't have time to train every day. And so, I use it for climbing, and I use it for piano, and I use it a couple times a week for those. And for me, it's all about getting more out of less. Because, like you, like a lot of people, we don't have infinite time to train. The last time I had infinite time to train was when I was six, and time had no meaning. And I could go out and practice with the soccer ball, or practice piano all day long. So it helps get more out of limited time.

Dave Asprey: When it's talking about using neurostimulation, the way that I use this ... And now, we're talking specifically about the Halo Sport, which is the thing that you helped to invent. This thing, you put it on, and you do something for 20 minutes. And what I've done, my ritual is, I will put it on, and I'll hang out and make coffee with my son.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And what my brain is doing that 20 minutes is sort of connect time.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And then at the end of the 20 minute neuropriming period, there's an hour of enhanced neuroplasticity. Then I go down to the Ping-Pong table, and I kick his ass. And by the way, Allen, who probably is listening to this, yeah, I know you win more than half the time, but I'm not going to admit that on the air, all right?

I found I could not keep up. The way 10-year-olds ... We started playing when he was maybe six. I would play with my left hand. I'm not left-handed, just to make it kind of fair. And it's to the point where if I play all out, we're very evenly matched. The problem is, he's 10. He's not done being neuroplastic. He keeps continuing, and I found that the only way that I can be a challenging opponent was if I did neuropriming.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And sometimes I'll actually do neuro-priming, and I'll start playing, and after that 20 minute period, I'll feel it kick in. It's like the ball slows down. And oh, there, now I can hit it. And it's a very tangible thing, which is kind of cool, because years ... In fact, you started Halo in 2013.

Brett Wingeier: Right.

Dave Asprey: Back in 2010, 2011, when the first tDCS research was coming out ... tDCS, by the way, just stands for Transdermal Cranial Stimulation, the ability to run an electrical current through a specific part of the brain. So I looked at this, and I bought a device that was not meant for doing that. It was meant for driving drugs through the skin.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And I said, all right, I'm going to do this. It was called the Chattanooga.

Brett Wingeier: That's the one.

Dave Asprey: It was quite expensive, and really inconvenient to use, but I said, "I'm going to do archery with this thing." The problem was, by the time I pasted these electrodes on, they were falling off my head. I never actually did it more than five or six times, because it wasn't convenient and all, and I said, "Well, this is one of those things where it probably works for snipers, and for drone pilots, and that kind of skill acquisition," because they are using tDCS for those things. But then when you came out a couple years later, I'm like, "Oh, this is kind of a cool piece of tech, because it's just headphones that work." And I started using it, and the reason that I wanted to interview you is I've become quite a fan of this, because otherwise I can't keep up with my 10-year-old.

Brett Wingeier: Right, yeah. And I've got a similar story with my nine-year-old. And again, the learning for physical stuff ... It's the same kind of learning that's going on with cognitive, language, anything. Because it's all your brain optimizing itself, and I had this experience with my nine-year-old.

She goes to the German School in San Francisco, and partially because we weren't fancy enough to get into the French School, and partially because she

was just tuned to language from day one. And I watched her just come home, and it felt like in a couple months, she was just fluent in German.

Dave Asprey: Wow.

Brett Wingeier: And we put her in this school, and I said to myself, "We're going to learn German. It's going to be fantastic." We don't speak German, you know? The last German speaker was my great-grandfather, and we had every ambition of, all right, we're going to learn this right along next to her. Nope. She talks smack about me in German. She comes home. She talks to her friends. They're probably talking smack to me even more in German, and you watch a kid learn, and it's this amazing thing.

And it's because, number one, they have the time. Number two, they have the focus, and depending on how you parent, they don't have as much of the ... You know, you don't have the phone with the work emails popping up every five minutes if you're a kid. And their neuroplasticity is just dialed in from day one, because they've got this brain whose whole job, whose whole reason for existence, is just soaking in information and learning skills.

Dave Asprey: It's amazing to watch what they can do, but you talked about language. So I have an auditory processing unusual brain, and I've quantified this. There's neurospectrums of sound that I don't hear the same in each ear, and it means that my auditory filtering is just different. And when I hear people speak French and Swedish ... My wife is Swedish and speaks French ... it sounds ... I don't hear the sounds. It just sounds like mush. She can say a word to me, and I'll say a different word back. It does not land in my brain, and that's always kind of pissed me off.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: So I did a couple different experiments. One is, I used one of the very first infrared light stimulators for the brain specifically. It was this homemade little rickety thing, and I put it over my language processing center above the left ear, and I spoke in garbled words in English for the next several hours. It scared the crap out me.

I'm like, man, I make my business in tech, communicating, and all of a sudden, I'm garbled. Fortunately, it got better, and I also tried running that ancient tDCS device, before you came out with something usable, over that same part of my brain. It didn't make me speak garbled, but I still couldn't do crap with French.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: Here's my question. When I'm stimulating my motor cortex, which is what the Halo Sport does today, is there anything I can do to make reading better, to make memory acquisition, or memory storage better? Or to make my language,

my hearing better ... make my vocabulary better? Are there any benefits to just running a current there? Or is this just for the motor cortex?

Brett Wingeier: So same technology, different part of the brain.

Dave Asprey: So you move the electrodes around.

Brett Wingeier: Exactly, yeah. If you look back at all the scientific background here, there have always been two main clusters of great results in data, and one of them is movement, primary motor cortex. And that's the easiest to hit with something that looks like headphones, but the other cluster of data here is in prefrontal cortex.

Dave Asprey: That's where I always put it. So I got to ask you this.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: I'm holding out this cool set of headphones with little rubbery combs on it that get through your hair. Couldn't I just take my Halo and wear it like a stupid headband instead of like a proper set of headphones, and stimulate my prefrontal cortex? I know this is probably isn't the look you were going for, but can I do this?

Brett Wingeier: So, it's-

Dave Asprey: You're allowed to say no because you're not allowed to say yes.

Brett Wingeier: No, so it's hitting the right part of your brain. That will hit prefrontal cortex, and as a product designer, I'm going to step back and say, wait for Halo to ... I'm going to tease this a little here. I'm going to say wait for Halo to come out with something that is a prefrontal cortex stimulator, and might be able to do exactly what you want, and look good at the same time.

Dave Asprey: All right. It's very important that when I'm stimulating my brain that I look attractive. I slept with an EEG sleep monitor on my head for several years, the old Zeo, and the very earliest.

Brett Wingeier: Yeah.

Dave Asprey: I've been tracking my sleep for more than 10 years, and a lot of the sleep hacking posts out there are copies of my original sleep hacking stuff. And I got to say, Victoria's Secret did not approve that model of headset ... big blue, stupid neoprene thing-

Brett Wingeier: Right.

Dave Asprey: ... and all that. But I mean, it's nice. You actually have really good industrial design on Halo. I was CTO of one of the wristband companies that does monitoring called Basis. So that's all good, but I'm not sure most of us really even care. I mean, if you make me a little bit smarter, and I have to look dumb for 20 minutes as I'm driving or something, I wouldn't care. But if you can make it cool, how soon do I get that?

Brett Wingeier: We're working on it. Put it that way, and Dave, you might just get a sneak preview of that.

Dave Asprey: That'd be terrible.

Brett Wingeier: And we might be looking at you to help beta test that.

Dave Asprey: I would love to be a beta tester. I envision a world, because I live in it ... a world where it's not as hard as we think it is to do all sorts of stuff. And you can increase energy in the brain, and a lot of my work ... how to make the cells make more energy. But running a current through your brain also adds energy to your brain, and there's questions in neuroscience about, how are electrons from an external source used?

We know from light that they actually can enter the electron transport chain, but do you think that we're going to end up in the future, five years from now or something, where we say, "Oh, great. You're 10 years old. Put on this Halo hat." Or, "You don't need it because you're 10, but you're 18, and you wanted to do this. So put this on, and run this piece of software, and it's going to be way easier than it was before."

Brett Wingeier: Mm-hmm (affirmative). With a 10-year-old, they're so plastic, and just so good at learning in the first place. That's further off, but somebody who's 18, somebody who has an adult brain, there's so much room to improve focus, and attention, and the ability to learn. You know, the potential of the brain is really limitless.

You've got 100 billion neurons, and 100 trillion synapses to optimize there, and one of the things about this field is we're learning so fast how all this works under the hood. And there's really some ground breaking discoveries, even just this year, about how this interacts with the fundamental neuroscience, and the fundamental mechanisms of how your brain processes information.

Dave Asprey: That seemed like a bit of a dodge. So five years from now, you're saying we're not going to do it with kids. So we're learning some more, but are we really just going to say, "Okay, today I want to do X, so I'm going to stick this thing on my forehead, or behind my ear, or wherever else?" Is this going to be a normal thing, or is this going to be the domain of pro-athletes, and Hollywood people who want to memorize their lines better? I guess, is this really a consumer tech?

Brett Wingeier: Yeah, so I'll give you the simple answer, yes.

Dave Asprey: Okay.

Brett Wingeier: So, sure, five years out, it's probably going to still be somewhere on the adoption curve, but the fact is, everybody at the end of the day wants their brains to work better. And everybody has points in their life where they need to get more from the limited time that they have to learn, or to train, or whatever. And we're learning so fast, so much about how this works.

That's why I mentioned that when I answered before. Five years from now, we're going to know exactly the waveform to deliver that is best for whatever category of stuff you want to learn, and you're going to be able to dial that up. We're going to be able to pair it with training content, learning content, optimize the stimulation for your personal electrophysiology, optimize the stimulation for the ebb and flow of your training, dial it in, and adapt it depending on how well you're doing. All that's going to be in the cards, and that's going to happen the next decade, and I think we're going to be seeing that five years from now.

Dave Asprey: What do you say to the Waldorf parents? By the way, my kids are in a Waldorf school. So what do you say to the Waldorf parents who are saying, "Technology? Kids, or even adults ... This is unnatural. It's cheating. What's wrong with learning the old-fashioned way through repetition?"

Brett Wingeier: Yeah, so that's still a great way to learn, but the thing about this technology, and we call it neuropriming ...

Dave Asprey: Mm-hmm (affirmative).

Brett Wingeier: The thing about this technology is you're still leveraging the brain's natural mechanisms of learning, and those are so powerful, and so effective, that it doesn't make sense to disrupt those. You know, it's not The Matrix. We're not downloading Kung Fu into your brain. It's using technology to make sure that your brain is dialed in, and ready to use its natural learning mechanisms where and when you want it.

I'll use an athlete metaphor here. I was a rower in college, and I know when I got the most benefits out of my workouts, whether it was cognitive or physical. It was when I was just completely dialed in. I was engaged. I was ready to be neuroplastic, and ready to focus. I sure as hell did not have ... I was not dialed in every 5:00AM practice. I was dialed in a fraction of those. So being able to bring that where and when you want it, that's huge. So you're leveraging the natural learning mechanism of your brain.

Dave Asprey: Okay, so it's different than downloading Kung Fu, which is sad, because if you could do that, I'd totally sign up for that.

Brett Wingeier: Likewise, give me 20 years for that one.

Dave Asprey: All right, 20 years for that one. There's something about, in my perspective of all this, about respecting your time here on Earth.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: If you could learn it twice as fast in exactly the same way ... the end results are the same, then why wouldn't you do it faster? And that's why I do my meditation with a computer telling me how to do it better, and deeper, and faster, so I can say, "Hurry, meditate," with legitimacy. And I think what you're saying is, if you're going to bother exercising, you might as well make your brain more neuroplastic, so the exercise will stick better, and you'll improve faster.

Brett Wingeier: Right.

Dave Asprey: Now what do you say to the people who say, "Well ... " What is the Halo now? What does it cost?

Brett Wingeier: It costs $399.

Dave Asprey: $399, okay. And by the way, that price isn't real for Bulletproof Radio listeners because, and thank you for doing this, you're offering $100 off for everyone who listens to the show, and uses code DAVE at checkout. That's a massive savings, so now it's $300, or slightly under.

So people are going to say, "Well, how is it that some athletes have a $400 device, and other athletes don't have access to this technology? Aren't we creating a divide where only people who can afford to learn can learn quickly?"

Brett Wingeier: Well, thinking about access like that, sure, it's always part of the conversation with a new technology. But if you go into any gym where people are seriously training, and you look around ... If there's a rack of Halo Sport in that gym, those Halo Sports might be the single cheapest thing in the gym.

Dave Asprey: Yeah.

Brett Wingeier: There's technology in these gyms and performance labs that costs hundreds of thousands of dollars.

Dave Asprey: Yeah, I have that Upgrade Labs thing down in LA. It's a lot of money for that kind of gear. So you're saying, look, if you go to a gym, you're spending $100 a month, right?

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And there are people who can't afford to go to a gym, and they go to the park, or they do a timed exercise, or whatever.

Brett Wingeier: Right.

Dave Asprey: But there's always advantages and disadvantages. It's a spectrum. And $400 is within the realm of consumer possibility, especially if it doubles your workout effectiveness.

Brett Wingeier: Right.

Dave Asprey: So then the ROI is very high on it. I do find I'm about ... two to three times a week is ... just because of the amount of time that I travel, and the amount of time that I'm home. And there's Ping-Pong available, and all that. What is the optimal amount of brain stimulation that you would say for the average human?

Brett Wingeier: This is one of those things where we turn to the science, and with brain stimulation, with anything with the brain, anything with your brain or body, you don't want to train by running a marathon every day. And at some point, there's a point of diminishing returns.

Dave Asprey: Mm-hmm (affirmative).

Brett Wingeier: So if you look at the science, what the science squarely backs up is using this once a day on the order of ... Say, every day, five days a week. Two or three days a week is perfectly fine. We don't really know where the point of diminishing returns is. Some of the science suggests if you do longer than a 30 minute session, which we don't recommend, we don't let you do, then there's probably some diminishing returns.

Dave Asprey: Is there harm?

Brett Wingeier: There's no evidence of harm. Any kind of training, if you use it past that point of diminishing returns, it certainly might not be a good use of your time. It might be counterproductive. There's no harm.

Dave Asprey: There's no harm, okay. That's a good thing. Having a good safety bar makes it a good decision to do something. I, for 20 years, have done electrical brain stimulation. Before tDCS was created, the Russians pioneered alternating current across the brain-

Brett Wingeier: Right.

Dave Asprey: ... as part of the space program. And they said, "Well, it's real expensive to send an astronaut to space, and then they sleep a third of the time. Why don't we just get rid of as much sleep as we can, so we can use less rocket fuel?"

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: That's a very Russian, and very cool way of thinking about solving a problem. And so they have this alternating current thing, and you could do that to sleep better. So I said, "All right, I've been working on hacking my sleep," and I used to suck at sleep. So there were times when I would sleep for only three hours a night, but I'd run 1.5 Hz current back and forth between my ears, and I'd wake up feeling amazing.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And I'm like, "What just happened? This is totally not what I would have expected." And for a hangover cures, I've definitely seen results from both tDCS and alternating current. And I may or may not have given my Halo to a friend who was hung over, and seen that they felt way better after 20 minutes.

Brett Wingeier: I will file that away, and we're going to have to work on some waveforms for that.

Dave Asprey: I imagine there probably are some that will be more effective than that, but it was actually really profound.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: The one case, the person was wrecked, and I said, "Well, why don't you try some brain stimulation?" Literally in 10 minutes, it was like, "Oh, I'm fine now. I'm good to go," and it was like someone switched the light switch back on.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: Neurologically, biochemically, bioengineering wise, what's going on with the electricity in the brain, and effects like that?

Brett Wingeier: Yeah, so you mention AC, and this is one of the most exciting things in the whole field right now, because-

Dave Asprey: Oh, just to be clear, we used direct current. We used the Halo Sport in the case I'm talking about there, but I've used my old alternating current stuff from the 90s as well.

Brett Wingeier: Yeah, so the mechanism for any of this, when you deliver an electric current to the scalp, enough of that makes its way through the scalp, through the skull. Those electrons in the form of ions, once they get into your scalp, and into your body, they create an electrical field around your neurons. And that electrical field, whether it's AC or DC, all of those neurons are participating in the same electrical field, because it spreads out over that patch of brain.

So what you're doing there is when you've got a moderate electrical field over all these neurons, it makes them more likely to fire together, because they're all participating in the same electrical field. Now, if it's AC or DC, it does that a little bit differently, but at the end of the day, you're helping neurons fire together. And that's the whole mechanism of how your brain optimizes itself, and how synapses change, and rearrange themselves.

Dave Asprey: Well, that'll drive synaptogenesis, growing new synapses and things like that. The other part of learning, though, especially skill acquisition at expert levels, is myelinogenesis, growing myelin, the electrical insulation around nerves like that.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And some forms of electrical stimulation will, we know, increase myelin.

Brett Wingeier: Yeah.

Dave Asprey: Essentially, the more electrical current the nerve has to carry, the more the body says, "Maybe I should insulate that one," and when it's insulated, you're more of an expert. What I don't know, what I'm asking you now is, is the amount of current that comes from Halo enough to drive myelin formation, or is this just about synapse formation?

Brett Wingeier: So the amount of current that's coming from Halo, or any kind of technology like this, it's probably not enough to directly drive myelin formation, although I've got say, I'm not an expert in that part of this.

Dave Asprey: Okay.

Brett Wingeier: But what it does drive is, it drives this synchronous neural firing, which synaptogenesis is only part of it, because part of the changes that happen ... You have the structural change of generating new synapses, but the way all of the fine tuning happens is the strength of all of these hundred trillion synapses is constantly being adjusted. So that when you get a signal from one neuron, the next one along is either more or less likely to fire.

And that happens way faster than synaptogenesis, and that's actually the core mechanism of how your brain optimizes itself. Now once you have enough of that happening, you can get synaptogenesis. You can get different patterns of firing, and then that can drive the myelination that you're talking about.

Dave Asprey: Okay, that makes a lot of sense, and the more they're firing, the more you're going to get it. The things that I'm familiar with that drive myelin specifically are more peripheral nerves. So some of the electrical stimulation gear that I have, that it feels like your body is kind of being hit with a taser ... That stuff will

definitely drive myelin. It's kind of ridiculous what some of it does, but it's intense.

Brett Wingeier: Right.

Dave Asprey: I don't think I'd want to put that on my brain.

Brett Wingeier: Right. Although the Russians probably have like 50 years ago.

Dave Asprey: I'm certain they have. If it wasn't the Russians, it was the East Germans.

Brett Wingeier: Right.

Dave Asprey: That's where, in fact, a surprising number of pieces of research about electricity in the brain have come from, Russia and East Germany.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: Do you know why?

Brett Wingeier: Every culture has a different approach to science, and I think there's something that resonates with the Soviet scientific mind.

Dave Asprey: Yeah.

Brett Wingeier: It's like let's put electrodes on it. Let's see what happens.

Dave Asprey: I very much appreciate that mindset. I think it's cool. And you look back in the field, that Russian stuff was late 60s.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: But there weren't a lot of papers, at least a lot of English papers. But in the last 15 years, how much research is there around not just reading electricity from the brain, because there's lots of that, but actually putting electricity into the brain? Dozens of papers, or is it a little bit more?

Brett Wingeier: I mean, it's thousands. There's 4,000 plus papers at this point.

Dave Asprey: Okay.

Brett Wingeier: And the whole modern field got kind of re-kicked off in 1999 by a German team, actually, at the University of Gottingen, and they basically said, "Hey, look at motor cortex. We can create these really reliable robust effects, and see it happen time after time again in this person, and that person, and the next person. Okay, so what do we do with this?"

It's clearly neuroplasticity, so then scientists all over the world started picking this up, showing that you could use it to accelerate benefits from training or learning. And so now we're standing at a point where not just DC, but AC, and something called TRNS, which uses a broad spectrum random noise ... It's been out there in the world of science for kind of a long time, in technological terms.

Dave Asprey: It's funny, at 40 Years of Zen, which is the neuroscience company that I started, five days intensive work with custom neuroscientists working on your brain, we use AC on the brain as a small part. It's mostly neurofeedback-based, but to get the brain ready, we'll use AC on the brain, which is alternating current back and forth, instead of just through one part of the brain. And we'll use a random noise.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: And the effects are really profound. The problem is it takes a huge amount of clinical gear, and it's something we do in order before we do certain kinds of neurofeedback, or other person development oriented training. So I've seen the effects. I actually have the clinical grade gear at home to do that stuff. But you can't really buy that unless you have some sort of license. This is not the sort of stuff ... but I'm really interested in the effects. So is this something that might be coming from you guys?

Brett Wingeier: Especially as we turn to cognitive applications, I'm going to say yes. A lot of the best, most recent data in using frontal stimulation, using this for learning and memory, and things like that, it's using alternating currents.

Dave Asprey: Well, there was a study. The New York Times reported on it, which was really cool. What are the odds of brain electrostimulation, neurostimulation ever being in the New York Times? You go back 10 years, this was the era of science fiction, and just craziness. And now it's not just real, it's being recognized as real.

Brett Wingeier: Right.

Dave Asprey: And the study that I'm thinking of showed that this alternating current across the brain improved working memory in older adults, so they performed the same as young adults.

Brett Wingeier: Exactly. Yeah, so this was a group at Boston University, and the Rob Reinhardt and Johnathon Nguyen, if I remember his name correctly, and it was a beautiful study, because it was one of these studies where ... So they did the thing that everybody tries to do when they do this science, which is they show, okay, this works.

Alternating current stimulation made working memory better, but then they did a few other things. They looked at the EEG, and what's called phase amplitude

coupling. They showed that when you see this working, you also see an increase in phase amplitude coupling. They compared it with younger participants and showed that, okay, this doesn't work as well in younger individuals, because there's not as much head room to get better. Then they stimulated opposite to the way they showed worked, and they showed, okay, look, we can make people a little worse by stimulating the other way, which you know ... It's not super useful out there in the world, but it's a huge part of the science.

Dave Asprey: Oh, it's really useful to be able to make people worse. One of the things that drove me down the neuroscience interest path that I have is that I got my first EEG machine in 1997, and started doing things to my own brain. The problem is, though, doing brain surgery on yourself is usually a bad idea.

Brett Wingeier: That's a good rule to live by.

Dave Asprey: Right? And so you realize your perception of reality can be changed. I mean, I had one time not that long ago where I didn't take the time to properly seat two of the electrodes, and it was this really advanced off the record brain training sort of things, and I do training protocols that are there for advanced states of consciousness and human performance that aren't-

Brett Wingeier: I would expect no less.

Dave Asprey: ... on the list. But man, I had two electrodes loose, so I wasn't getting a signal from them. I was a zombie. I mean, for three days I couldn't ... I was just dysfunctional. And that's why I have a couple neuroscientists working for me as well. I'm like, "Let's trouble shoot this." And we looked at the record of the training, and realized electrodes were loose, so I actually up-trained those parts of the brain.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: But the moral of the story is that if you can make the technology to make someone worse, it means it takes someone like you with 50 patents, and you've studied neuroscience for a long time, to figure out how to do this. Not just in a study somewhere, but to do this on a large number of people's brains that's going to be beneficial by making phase coupling happen. So I would like to have that, so I can wake up in the morning ... instead of strapping on a bunch of gear from a neuroscience lab with Velcro, and goop, and all that crap, to be able to just put on a Halo headset and say, "Make my brain act like a young brain today." How long is it going to be until I can do that?

Brett Wingeier: So, we're on it.

Dave Asprey: All right, you're working on it.

Brett Wingeier: We're on it, yeah.

Dave Asprey: And you don't have to give me a launch date, but we're talking in the order of a year or two, not five years.

Brett Wingeier: You know, I think we're talking a year or two here.

Dave Asprey: Okay.

Brett Wingeier: And that's exciting on its own, and just talking about what the future holds here. That what we, and I think everybody in the field, will have in five years is the ability to not just deliver this neurostimulation, but to personalize it. Because one of the key principles of interacting with the brain is you've got to close the loop, and that's actually what my co-founder and I did at our previous company, Neurobase, is we were working on implantable neurostimulators for epilepsy.

Well, that neurostimulation works pretty well if you turn it on and leave it on. Turns out it works better if you watch for seizures about to start, and then you stimulate right when the seizure is about to start. So it turns out it's this general principle for working with the brain. Everything is better when you personalize it, when you close the loop, and you make it responsive. So we have our electrical engineers right now working on things like being able to record biosignals from the headset.

Dave Asprey: Wow.

Brett Wingeier: I mean, that's not today. That's not tomorrow. It's not two years from now, but that's kind of the wave of the future, and that's the kind of thing that not just us, but everybody out in the field, in academia, is thinking about.

Dave Asprey: There's been a longstanding problem of getting electrical signals off the brain because when you move, your muscles make electricity that's way stronger than your brain electricity, so you get artifacts all over the place.

Brett Wingeier: Right.

Dave Asprey: So if you solve that problem with a pair of headphones, kudos. That's been just a long standing neuroscience annoyance.

Brett Wingeier: Yeah, I mean, it's a hard problem, and one of my biggest moments of chagrin in my scientific career was back in ... My PhD was in EEG and electric fields in the brain, and back in 1998, I spent about a week thinking I'd made just an earth-shattering discovery of ... There's this synchrony. It happens in the temporal lobes, and it happens when ... We were watching people doing mental subtraction, this was when everybody in the field was first starting to appreciate a lot of what synchrony between different parts of the brain mean.

I mean, I thought this was like Nobel prize material. And then we realized, this was a participant who ... They had math anxiety, and they were clenching their

teeth when they were doing this mental calculation, and it wasn't even brain. It was their temporal muscles with all this highly coherent activity, because they were clinching their jaw.

Dave Asprey: Artifacts are just the bane of anyone's existence who works on this. People listening to the show will be like, "What the heck is an artifact?" But here's the thing, if we're working on the signal ... You're working on increasing motor function with running a current, and you think you're getting increased motor function, but you're not because of bad data, for example, it's a massive problem in science. And even things like FMRI, which is a way of even looking at people's brains ... They just noticed that the algorithms used in pretty much all FMRI research for the past 15 years were wrong.

Brett Wingeier: Right.

Dave Asprey: So all these neuroscience conclusions were wrong. So the ability to actually get a real picture of what's going on in the brain, so you can perform it ... It is really hard work. But you've done way more work on it than I have. How hopeful are you that we're going to actually get good signals of what's going on in the brain when we're just going about our daily business?

Brett Wingeier: You know, it's hard, but it's doable.

Dave Asprey: Okay.

Brett Wingeier: You know, everybody in the field has learned a lot more about, what does artifact look like? How do you separate it out? And so much of this is understanding that you can't always get good signals, but what you've got to be able to do is understand when are we getting a good signal, and when aren't we? Because it's okay if they're not great signals all the time. You've just got to be able to understand when is it good? So you can draw your conclusions from that.

Dave Asprey: Okay. So the ability to parse out the bad stuff. I've worked with a developer at 40 Years of Zen to say how do we identify a bad signal to just cut that out.

Brett Wingeier: Right.

Dave Asprey: I just don't want that. And I think there's lots of neuroscientists all over the place looking at machine learning, and different ways to get that out. You guys clearly have the ability to know what's going on in the brain because you're an expert, and because we just walked through the labs. I've seen all your gear there, so you have the ability to say, "All right, we're going to stimulate the brain, and see what the brain does," which is super cool. I just want the day when I can get on my iPad, I can say, "Oh, here's what my kid's brain is doing. Here's what my brain is doing."

Brett Wingeier: Right.

Dave Asprey: Here's what all of our employees brains are doing, and wow, they're all in chaos. Maybe we could do something about that. Not in an invasive way, but in a helpful way.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: I don't want to read people's minds, although that'd be fun, too, but what I'd like to be able to do is like, this person's like seriously not in a good place. Maybe we can just say, "Why don't you take the day off?" Wouldn't that be awesome?

Brett Wingeier: Yeah.

Dave Asprey: But right now we don't have the signal.

Brett Wingeier: Right.

Dave Asprey: And if we did have the signal, there's probably a whole bunch of privacy and ethical questions, and things like that. But the bottom line is that if you own your signal, and you can say, "All right, I'm getting a red alert on my phone that says my brain is jacked today, maybe I'm going to do something," right?

Brett Wingeier: Yeah.

Dave Asprey: Okay. We're painting a picture of the future that could either be really dark or really beneficial, but along the way, the ability to learn in less time is ... I don't think there's any ethical questions about that that are credible. People are going to say, "Well, it's not fair. It's cheating," whatever. Using clothes to stay warm is also cheating. So we're going to just let the Luddites die. That's what happens to them. I want to talk about some of the cool new stuff you're working on with Halo.

Brett Wingeier: Yeah.

Dave Asprey: I talked about language acquisition, which is actually really a hard thing to do, but we also mentioned music.

Brett Wingeier: Right.

Dave Asprey: And you're doing something now specifically to study neuroscience and music. What are you doing with Halo around that?

Brett Wingeier: Right, so we have this partnership with Berklee College of Music. And it's the Berklee in Boston, not the Berkeley just across the Bay. I mean, obviously, a legendary music school, and we actually kicked that off this summer. And the

way we started was we offered a fellowship for music students, a couple from Berklee, Stanford, to come here and do some experiential work, and some controlled studies using neurostimulation for performance, for songwriting, actually.

Dave Asprey: Oh, wow.

Brett Wingeier: Yeah, we had a songwriter and she used, not Halo Sport, she used a different form factor to increase creativity. And she more than tripled her output of songs, because she was able to dial up and dial down that creative output, and the ability to focus.

Dave Asprey: Through electrical stimulation, not feedback?

Brett Wingeier: Through electrical stimulation.

Dave Asprey: That's fascinating. I want to learn more about that. I'm intrigued that there might be specific stimulation things that anyone listening to the show could do that would allow them to be better creators. When is this going to be commercially available?

Brett Wingeier: Right. Yeah, so-

Dave Asprey: I'm not pushing on you or anything there.

Brett Wingeier: No, no pressure.

Dave Asprey: But sign me up!

Brett Wingeier: Yeah, so the answer there is, again, this is prefrontal cortex, so it's not today, and it's not tomorrow. But it's on a road map, and it's something to be looking for in the next year or two. And again, Dave, you're probably going to see it before-

Dave Asprey: You're going to hook me up. All right, that's good. Because do you remember there was something ... I'm probably going back to the 90s, and if you were in a certain gang you'd put your bandana really low over your forehead?

Brett Wingeier: Oh, yeah.

Dave Asprey: All right, so I'm not opposed to taking my current Halo and just kind of giving myself that mono-brow with it, because if it's going to double or triple my writing output, or make me a better podcast interviewer, or whatever, I would do that right before an episode in a minute. Okay, so that's pretty exciting, and you have a long history of working with pro athletes. You are doing some stuff with Titleist Performance Institute, which is a very well respected thing in golf. What's going on there?

Brett Wingeier: Yeah, so one things about TPI is they're all about using practice time wisely and really scientifically refining every part of the golfer's stroke. Charlie Hoffman, just really successful golfer lately. He's a pretty dedicated Halo user, and it works for him the same way it works for you and me, which helps him get more out of the amount of time he has to train. Because nobody wants to be in there on the driving range eight hours a day.

Dave Asprey: And plus, your shoulder wears out.

Brett Wingeier: Exactly, yeah. And that's one of the key things we've learned from working with, not just professional athletes, but with people like US Special Forces. When we first started working with Special Forces and we started talking with these guys, and we started the conversation in terms of, "Okay, you can get better." And they were like, "We don't want to get better. We're already at the top of our game. What we want is to be able to maintain this strength and skill with less time in the gym, so that our guys have less chance of getting injured, and can spend more time working on other stuff like these professional skills, learning languages, strategy, all the other things that make up their skill set."

Dave Asprey: It sounds like the same thing everyone listening wants. I want to spend more time doing what I wanted, less time to maintain myself.

Brett Wingeier: Right.

Dave Asprey: I'm all over that. Everything that we do as human beings since the beginning of time has been about saving time and energy so you can do what you want.

Brett Wingeier: Right.

Dave Asprey: Right, so this is just a continuation of that even at the highest Special Forces level. Okay, something we haven't talked about yet, something that really intrigues me ... You mentioned it when I was coming into office, coming off of the elevator. I didn't realize you'd written some papers on it until I looked through my notes. It's around endurance, which is very different than skill acquisition. Right.

Brett Wingeier: Right.

Dave Asprey: You're finding that people actually have muscle ... that their muscle fatigue doesn't happen as quickly if their brain is stimulated or they're able to cycle for longer.

Brett Wingeier: Yes, right.

Dave Asprey: Tell me about what you figured out there, because this is ground breaking. We have a lot of pro athletes who listen to the show.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: Not to mention the weekend warrior types.

Brett Wingeier: Mm-hmm (affirmative).

Dave Asprey: So what does brain stimulation do for endurance?

Brett Wingeier: Yeah, so there's two parts to that answer, and the short answer is it helps your endurance. It makes you ... It increases your time to exhaustion, and it also ... There's this feedback between skill and endurance where that gets compounded if you bake in your skills into muscle memory more, because then you can keep your form for longer.

Dave Asprey: So it takes less electrons to manage them.

Brett Wingeier: Yeah, and let me give you an example from my athletic career. I was a rower in college, which was fantastic and sometimes brutal, and cold, and wet, but an amazing experience. But one of the things about any kind of endurance sport is you get out there, and you're really pushing the limits of your capability, and as you do that, you get more and more pain, more and more fatigue, and your technique starts to break down. And once that happens, the pain starts compounding, and all of that ... you get this cascade of failure when you're at the limits of your endurance.

And one of the antidotes to that is to bake everything better and better into your muscle memory so you can keep good technique in the face of that pain and fatigue. That's part of the answer. That's a super powerful effect, and that's something that I've seen myself in my own training. The other part of the answer is that endurance is all about your motor cortex's ability to keep firing all of those neurons, to keep those systems running creates synchronous output to your muscles.

Again, in the face of pain and fatigue. And that's something that you can train your motor cortex to do and by using neurostimulation, you can actually increase your motor cortex's ability to keep all that going in the face of exhaustion.

Dave Asprey: How much longer?

Brett Wingeier: So the best data show it's incremental but meaningful improvements. Things like 10, 20, 30 percent.

Dave Asprey: So you could potentially cycle 20% longer than you normally could?

Brett Wingeier: Right.

Dave Asprey: This is if you primed your brain before you cycled, or you're priming it while you're cycling? Do you have to wear the Halo under your helmet? How does that work?

Brett Wingeier: No, so this would be a 20 minute session before your training.

Dave Asprey: Wow. Okay, so these are very meaningful numbers. What about muscle strength, you know, weight loss, weight lifting kind of stuff?

Brett Wingeier: So same thing for muscle strength. One thing that's a really cool fact about strength is that when you first go into the gym ... let's say you haven't been training, and you go into the gym, and you start a strength training program, you get these immediate gains in strength. And it's not your muscles getting bigger. It's not your physiology changing yet. It's that your brain is actually getting better at sending those signals to your muscles so you get all the right contractions at all the right times for a smooth, powerful output.

Dave Asprey: Wow. In the studies you did, did you use the Halo Sport one, the first one that I used? Or did you use the Halo Sport 2, which is the one I've used for about the last six months?

Brett Wingeier: So most of the studies were Halo Sport one.

Dave Asprey: Okay, got it, but it's the same waveform in 2, just two is a better form factor.

Brett Wingeier: Same waveforms, same nibs, same all the rest, yeah.

Dave Asprey: The Halo Sport 2 is more affordable, and cooler.

Brett Wingeier: Exactly.

Dave Asprey: And you've got two studies out on this.

Brett Wingeier: Right.

Dave Asprey: Okay, so would it be out of line to say if people are listening to the show and they wanted to be able to lift 10% longer ... so it increases in strength, or decreases in the amount time it takes to get fatigued.

Brett Wingeier: Yeah, so both.

Dave Asprey: Okay, so they can lift more.

Brett Wingeier: Right.

Dave Asprey: Okay, and they can go for longer.

Brett Wingeier: Exactly.

Dave Asprey: All right, so at least a 10% improvement is what you found in the study.

Brett Wingeier: So at least a 10% improvement for something like time to exhaustion.

Dave Asprey: Okay.

Brett Wingeier: The data in strength is ... it depends on what kind of athlete you are.

Dave Asprey: Okay.

Brett Wingeier: If you're a beginner, then you're going to get better, faster. And those gains are probably going to be on the order of 10, 20, 30 percent faster. If you're an experienced athlete, you're not going to get 10, 20, 30% stronger. In some cases, that would make you super human.

Dave Asprey: Yeah.

Brett Wingeier: We did a study with Sparta Science, which is this performance center down in Menlo Park.

Dave Asprey: Mm-hmm (affirmative).

Brett Wingeier: And those guys got three, four, five percent stronger, more explosive on things like vertical leap. If you're a skilled athlete, that's super meaningful.

Dave Asprey: That is a massive improvement. All right, well, those studies, I think just speak for themselves in terms of what Halo Sport does. People really want to move well. I just found that even the fine muscle stuff, the ability to hit a spin shot, seeing the Ping-Pong ball slow down, this is meaningful stuff, and I think it isn't yet a big enough part of the national conversation about, hey, if you wanted to improve, you could do this. And there's nothing that says you can't have one Halo in your family.

Brett Wingeier: Right.

Dave Asprey: You know, you share it with people. I haven't let my kids use it, though, because I figure I don't really know. And I'm sure that the insurance companies say 18 or older for this.

Brett Wingeier: Not only are kids super neuroplastic and just super good at learning and training anyway, if you're a kid, your skull is thinner. I mean, sure, your brain doesn't instantly change when you turn from 17 to 18, but it is intended for adults only.

Dave Asprey: Yeah, it's also not sized for kids.

Brett Wingeier: Right.

Dave Asprey: So I've never run electrical stimulation on the kids. I definitely do feedback training, so their brain can better regulate itself, but it feels like this is an adult technology.

Brett Wingeier: It is.

Dave Asprey: And this is kind of a leading question. I set you up there, because your prefrontal cortex doesn't really get backed till you're 24 or 25. Is this something for young adults as well?

Brett Wingeier: So yes, and one of the reasons I say that is because basically all of the neuroscience literature that's ever been produced, studied, every study that's been done, virtually, happens to have been done in neuroscience undergrad and grad students.

Dave Asprey: Okay, that's really smart. Pretty much they've only tested people in their early 20s.

Brett Wingeier: Right.

Dave Asprey: Okay, I gotcha there.

Brett Wingeier: Yeah, there's a lot of studies where they've intentionally gone out and done adults, but if there's a result you see in the neuroscience literature, it has probably been shown in people from 18 to about 24.

Dave Asprey: Okay, that is profound. I'm just thinking. Have I ... I've done neurofeedback on my parents in their 70s. I haven't gone into like [inaudible 01:00:40]. I've had people come through after their 70s in the training. But I'm just wondering, should I go to my grandmother, give her my full stack of cognitive enhancers, and then put a Halo Sport on her to see what she does? She's 97.

Brett Wingeier: 97, wow. So I can't speak for the nootropics and some of the cognitive enhancers, but I can speak to neurostimulation.

Dave Asprey: Okay, and let's talk about that. I just feel like it works better if the cells have enough power to fire up again.

Brett Wingeier: Yeah, and there are changes that happen late in life, and again, if you step back and look at the data, we scientists will look at the data. The data get more clear in healthy, older adults because there's ... and healthy older adults up to a certain point. The data ... 75, maybe 80, looking at results like this Reinhardt study we talked about, because at that point, there's more headroom to improve.

You're part of the way into this path of decline in working memory and things like that, and there's more need for something to help with it. Now, if you get to somebody who's 95, there are changes in ... you know, there's changes in brain anatomy. There's a thicker layer of cerebrospinal fluid. And it puts you in a place where the data aren't as well baked.

Dave Asprey: Also, there are vanishingly few healthy older adults.

Brett Wingeier: Right.

Dave Asprey: So the sample size gets smaller and smaller. As a guy with a track record of being right before the studies a good amount of the time and stuff, I would bet on the electrical stimulation as being a beneficial thing to do a couple times a week in general as part of a broad spectrum anti-aging brain program, and I've been doing it for 20 years.

Brett Wingeier: Yeah, and one of the things about this technology is it's best used when you pair it with some kind of cognitive training, learning. So we're not saying don't do the crosswords. Don't do the brain training. Take neurostimulation, pair it with high quality mindful, thoughtful brain training, physical training, and then it's all going to operate synergistically.

Dave Asprey: That sounds like a pretty good program for performing well for decades and decades and decades. Well, that was my final question for you, other than the final, final, which is-

Brett Wingeier: The final, final ... bring it.

Dave Asprey: How long are you going to live? I mentioned my number, 180. You've got 50 patents. You're a bioengineering neuroscience guy. You know a thing or two. What's your number?

Brett Wingeier: How long am I going to live? I really think at least 150.

Dave Asprey: There you go. High five on that one.

Brett Wingeier: There's so much ... we're learning so much.

Dave Asprey: Yeah.

Brett Wingeier: And it's the stuff you're working on. It's the stuff that's out there in labs all over the world, and the stuff that's going to cure cancer, and is going to fundamentally figure out how to reverse these cellular processes of aging, where you know, the ends of your telomeres or whatever are getting knocked off bit by bit. The work that is going to nail that, it's probably happening literally right now.

Dave Asprey: We're hacking all of it. In fact, that's one of the seven pillars of aging that I write about in Super Human, where, yeah, there are teams making massive progress on all these things, and progress is accelerating. And heck, let's neurostimulate all the teams doing that and make it accelerate more, but it's all feeding back on itself, so I just don't think you're crazy at 150. It sounds achievable, so good for you, man.

Brett Wingeier: Awesome, well, looking forward to meeting up 100 years from now and comparing notes.

Dave Asprey: Well, if you liked today's episode, there's probably a couple things that you want to do. One is, you might want to start incorporating neurostimulation into your life, because whether you're going to go to yoga class, or do whatever your sport is, or maybe you don't really have a sport, because you just exercise a little bit to stay healthy, you are still going to get more per minute out of your exercise if you do it neurostimulated than not.

So if you want to do that, go to HaloNeuro.com. H-A-L-O-N-E-U-R-O.com. Use code DAVE and save $100, which is a meaningful amount of money. And while you're at it, you should be reading Super Human, because if you're not reading Super Human, you're probably not a Super Human. So you can pick that up anywhere books are sold, and if you were to actually use the Halo Sport while you are reading Super Human, no one knows what will happen. But maybe you can be the first.