# Exercise for Enhancing Neuroplasticity and Alzheimer's Risk Reduction Transcript

(Transcripts are generated by AI and may contain errors)

## Introduction and Speaker Background

Welcome back to the Reverse Alzheimer's Summit. I'm your host, doctor Heather Sanderson, and I'm thrilled to have Doctor Sarah McEwen here today. Doctor McEwen is a cognitive psychologist and has 15 years of research experience experience in both academic and clinical settings.

Doctor McEwen has a PhD in psychology and completed her NIH T32 Fellowship in Cognitive Neuroscience in the UCLA Department of Psychology. She has extensive experience in human functional brain imaging in the fields of severe mental illness, neurodegenerative, and neurocognitive disorders.

Using innovative multimodal MRI approaches to identify brain changes in structural and functional connectivity and neurochemical markers of exercise dependent neuroplasticity.

Doctor McEwen is a senior research scientist at the Providence Saint John's Health Center Pacific Brain Health Center in Santa Monica, California, where she conducts precision medicine randomized controlled trial research in patients with mild cognitive impairment and early Alzheimer's disease.

Doctor McEwen also serves as an editor for the peer reviewed journal Neuro Report. She is also an associate professor in the Department of Translational Neurosciences and Neuro Therapeutics at the Saint Johns Cancer and Institute, and was previously a research scientist in the School of Medicine, Departments of Psychiatry at UCSD and at UCLA.

While faculty at UCLA, she was the Pi of an NIH and I am HK1 and an MRI. Savvy young Investigator. Awards. And the prior primary investigator of a CTS I pilot study of a memory and exercise training program in older adults.

She is currently a co-investigator on an NiMH HR1 of exercise in cognitive training in psychosis patients and National Parkinson's Foundation Award. Looking at the different differential effects of motor and aerobic fitness on brain circuitry in Parkinson's patients with mild cognitive impairment.

Doctor McEwen is also currently the primary investigator of an NIH R 21. She's conducting the Pacific Brain Health Center to study the effects of a digitally delivered, home based exercise and compensatory memory training program in patients with mild cognitive impairment.

This is an important trial to conduct in this emerging field of combinational early cognitive remediation interventions in mild cognitive impairment to prevent the progression to Alzheimer's disease.

She is also passionate about advancing clinical care and treatment in an outpatient setting while also developing, studying, and implementing novel multimodal lifestyle intervention programs.

Doctor McEwen. Welcome to the Senate. That is impressive by all. Thank you. And I'm sorry about that long introduction. I love it. I think I walked right past them where I learned about you and your passion and commitment and just big excitement around learning how we can prevent and reverse Alzheimer's is so clear from from all of the work you've done and just the quick, you know, chat that we've already had.

So welcome to the summit. Thank you. Thank you. Heather. Thank you for having me. Thank you for the participants for coming. I really appreciate you inviting me. Thank you.

So one of your big areas of expertise is how exercise impacts the brain. Let's just start there. Yeah. I don't I don't like to, to, to use this word loosely, but panacea is how I would describe exercise.

There's really nothing I've ever seen. And, all of my years of research is of looking at how, you know, activities can

affect the brain and disease states and, and in, preventative ways.

But exercise does seem to be that magic bullet. It does seem to be that one thing that just keeps coming up time and time again of why, you know, why.

Why would it work? Why? Why is it so profound? To us. And, I mean, you can always think of it from an evolutionary perspective.

## Exercise as a Brain-Protective Tool

I mean, it is who we are. You know, there's a really, really, really cool book that came out, quite a few years ago now, but it's called Born to Run and, it's a book by Chris McDougall, and he talks about, this, Indian tribe that lives in the Copper Canyons in Mexico, the Tarahumara.

And it really looks at how the impact of their lifestyle has, just incredibly reduced the risk for, you know, major illnesses that we suffer within modern society.

So type two diabetes, cancer, other types of cardiovascular disease are basically non-existent in this population. The small population of Indians that live in these mountain, mountainous terrains, and they have to run every day and they have to be active all day long.

And it just shows that, you know, even in this modern world we live in, there's still people that live in such a way that have physical activity and lifestyle as just being their main component of their life.

And, and that's been preventing them from getting sick. So, you know, taking that as a very, you know, lofty goal to be able to run, you know, 200 miles or something like that, you know, but this idea that, you know, 80% of, of our population doesn't even meet the, the the lowest level of recommendations for exercise is just to point in, you know, so I feel like as an advocate and custodian to science, you know, that I wouldn't be out there.

And I just want to be telling people how important exercise is. And it's not just something that you do to look good or something, you know, but it really actually does have a fundamental level in your brain to be able to change the way that it functions to, you know, preserve it as we age.

It increases something called cognitive reserve, which you could think of as like a savings account for your brain. So this idea that, you know, the activities that you do throughout your life can actually preserve your brain, even in the face of injury and insult, even, as you know, amyloid might be building up in the brain.

You've built up this reserve through exercise to be able to fight it and not let it, you know, consume your cognitive functioning. So there's, you know, many, many different layers we can talk about from neurochemical improvements to, you know, plasticity improvements to actually growing new neurons in the brain.

I mean, there's just so many levels that exercise that that it's just like, you know, pick one and you'll find it, you know, circulation fade. I think one of the things that surprises people is that even as we age, even like people in their 80s and 90s, that neuroplasticity still exists, that you still can form new neurons.

So can you talk about a bit of a science around that? Absolutely. So I mean, it was really sad, but it was basically until the 1960s, I want to say, until a neuroscientist came along, and was able to actually show that neuroplasticity still happens and they don't brain a lot of people thought that what you were born with was the brain, that you were essentially stuck with, you know, and it was genetics that played into it.

But actually the the reality is, is something called experience dependent plasticity. And basically what that means is that your brain has this incredible agile ability to reorganize itself all throughout life based on the things that you do.

So you know, you could think of, neuroplasticity as being something that helps you form, you know, new connections in the brain. It helps the sprouting of new neuronal fibers.

And all of this is because of the things that we do in our daily lives, and that we have the ability to do that, because of our brains innate ability to do so.

And it's it's hard wired, in such a way, though, that it's very responsive to exercise and the changes that exercise could bring on the brain. So, one of the most common ones you'll hear about, though, and this was a lot of the work that was done, back in the late 90s at the Salk Institute by Fred Gage and Henrietta Van Frog, where they had animals, that they would put in a cage with a running wheel.

And, what they did was they looked at the difference between the animals that had the wheels in cage, and they were running in there. So unlike humans, where you put a treadmill in a room with us, we had clothes on it or something, you know, the, the, the, the animals actually like to run on it.

So they, they had them several weeks running on these wheels, and then they had another group that didn't have a wheel were there. And then they looked at the brain, specifically the hippocampus in the brain, which is the learning and memory center in the brain.

And they looked a little tiny samples within the hippocampus. And they found that in the animals that were exercising, they actually sprouted brand new neurons, adult neurons in the brain, because they were exercising where they didn't see that same effect in the sedentary animals.

And this was just a few weeks of doing exercise. But they showed that these new neurons sprouted in the brain. But some of the more interesting research that's happening right now is showing that even though that neurogenesis is happening in the brain and exercise can grow, those new neurons, they actually will quickly die off in the absence of some sort of a cognitively stimulating environment.

So the idea that those new neurons actually need to latch on to something in there and become integrated into the system is really important. So it's this whole idea of, you know, not only growing the new neurons, but that in adding some sort of a cognitive or cognitively stimulating environment or challenge actually helps those neurons actually link up and survive within the hippocampus in the brain.

So it sounds like when you were describing on a hamster wheel is cardio. Does it matter if we're getting cardio or strength training? Yes, yes it does.

And I, I just want to say to both of them are equally important. Right. So I think a lot of people prioritize like walking because it's really easy to do.

Like you can just go out of the door and do it, you know, but it's almost just as easy to get some dumbbells as well too, or, you know, get a virtual trainer or an app or something like that that can help you do some resistance muscle building exercises.

## Neuroplasticity and New Neurons

Because actually, the American College of Sports Medicine actually recommends four different kinds of exercise. So aerobic, which is like, you know, you're walking and you're running and jogging and swimming.

But then also resistance to strength training exercises. So resistance machines, dumbbells, bodyweight exercises, things like that. And then something called neuro motor or skill based exercise.

So this is one of kind of one or more of the newer areas of research where a lot of people are looking at, the different types of exercise and how they affect the brain.

And they look at things like, dance, or Taichi or Pilates or boxing, things like that, and how those affect the brain. And, some of the research I've done in Parkinson's disease, I actually looked at this, systematically.

So we looked at different kinds of aerobic fitness. So people that had really high, VO2 max, which is basically a

readout of how aerobics fit you are.

And then also people that had high, motor scale fitness. So this ability to, do different kinds of like gait and balance tests, things like that. And we were really interested in looking at how, the different types of fitness affected the brain.

And for aerobic exercise, what we know is, as I've talked about, we are running it. We know that that improves neurogenesis in the brain at that level.

So we know that, it forms, new neurons. And it also does something called angiogenesis, which is the formation of new blood vessels as well. And usually this happens, as I said, in the hippocampus, which is the medial temporal lobe in the brain.

So that's in the middle of the brain. And that exercise has been shown through different brain imaging studies to increase, the actual size, the gray matter volume in the medial temporal lobe, and then a little bit in the frontal lobe.

So more of those like higher order thinking parts of the brain, and then the sensory motor network too. So there's been some really cool research on that in all of those areas.

I was just talking about some sort of memory. So aerobic exercise is really fundamentally trying to improve memory for some reason. That just keeps coming back again and again.

And all of these research studies, big brain imaging studies or, you know, behavioral cognitive testing studies, it seems that people that have this higher aerobic fitness have better memory skills, larger hippocampus.

But then the different kind of fitness is that motor skill fitness. So that's the things I was saying, like the dancing or the boxing or doing things like that, that actually seems to have a much different impact on the brain.

So whereas you could think of aerobic exercise being kind of bottom up as like kind of low level sensory processing and memory functioning motor skills, actually more top down.

So if you think about it, it makes sense because basically, motor skill learning is all about having a goal and doing, you know, movements that are all around trying to reach that goal.

With predetermined outcomes. You've got a lot of novelty that's happening to a lot. And it's just it's a very different kind of exercise. And with that, when we actually see more synaptic genesis within the brain.

So this is actually the formation of new synapses between the neurons in the brain. That seems to be what's happening in this more skill based exercise.

And then that structural level, you see parts of the brain increasing in the prefrontal cortex, so that higher order thinking part of the brain, but really hitting that hard to think about it.

When you're learning a new skill, you really have to think like, not just like, you know, when you're running. It's kind of an automatic movement, but when you have to do a new skill learning, that's a lot of the frontal cortex, anterior cingulate, kind of problem solving, online processing, those sorts of things.

So it actually increases the size of those parts of the brain. And it also helps at the behavioral level, we see changes in cognitive functioning for more executive functioning, more reasoning types of exercises, things like that.

So that's really been kind of the the landscape, if you will, for the different kinds of exercise and, and how they differentially affect the brain. Pretty pretty profoundly.

That's really inspiring. To get out there and like learn a new skill and also not to rely on like, oh, I was good at volleyball when I was in high school.

And so that's going to serve me forever. But like, okay, I need to pick up some other type of activity and always be sort of challenging your brain to do that so that you continue to develop those areas.

Exactly, exactly. But I mean, I can I can say this for certainty. I probably get the question there every day of like, what's the best kind of exercise for my brain?

Right? You know, and it's like, well, I mean, I always start at the place of saying like, well, clearly like you have to do what you enjoy. Like, I'm not going to tell you to do something that you aren't going to find enjoyable.

You know, in addition to being a research scientist, I also did a, fitness leadership program at UCLA. So I'm also a certified personal trainer. So one of the things you learn as a personal trainer is, yeah, you have to meet people where they're at.

It's the same as like a health coach or, you know, a brain based coach. It's it's somebody that, you know, is able to understand where you're coming from and what you're interested in.

So maybe it's, you know, volleyball that was your thing back then. But, you know, how can we think about integrating that into your life now? Like, what other kinds of activities.

Maybe it's ping pong. You know, maybe it's going to be something different. You know, maybe it's a smaller scale, maybe it's a competition piece of it you like, or, you know, maybe it's an individual sport that you're more into.

So you really have to think about that. In terms of prescribing exercise to people because, you know, I mean, there's a million things under the sun you could be doing, but but including in addition to the recommendations that I usually have for exercise or really doing, aerobic exercise five days a week, at least 30 minutes, at least in moderate intensity.

I don't want to be able to talk to you when you're exercising with me. Aerobics lately. That's a key right there that intensities things that you have to really dial that in.

It can't just be walking the dog. It's not going to be intense enough. It's got to be a little bit more, and then having two days of the muscle building because we know as we age, you know, we can, you know, sarcopenia, we get osteoporosis.

So we need to make sure that we're doing muscle and bone building exercises at least twice a week, and doing at least like 6 to 8 different muscle groups for that.

But then for these like neuro motor and scale, all sorts of things, like the dancer, the Taichi, I would also say two days a week, two of at least 20 minute sessions.

## Types of Exercise and Brain Effects

So really this idea of doing like multi-component exercise training to and then to just kind of layer it on a little bit more, you know, what about the idea that you can, make I don't want to call it like an artificial environment, but somehow that you could be adding some sort of another cognitive challenge to it, you know, so obviously, like with a sport or, you know, with dancing or you're learning a new skill like that, clearly that's all novelty and that's doing something different.

But it's interesting because you don't actually get any feedback about it. So there's been a lot of research that's done on. Have you heard of like neurocognitive, like computerized training before that people do, like Posit Science?

Yeah. Michael Meyers, Doctor Michael Meyers, and it's work at UCSF. So his idea that, you know, you know, training neurons that fire together, wire together, so explicitly training different kind of lower level cognitive networks.

So the idea of training like memory networks or attention networks and playing computer games that are known to like, activate those sort of neuronal systems seems to be really effective.

But the problem with those, you know, sitting in the computer playing video games, thing is they don't really transfer very well to like, everyday life.

You know, it doesn't mean you're going to forget where you park your car. You know, it doesn't mean that you're going to remember, you know, your your, your daughter's friend's name or something like that, you know?

So, doing more specifically targeted neurocognitive drills is really important. And some of the work I'm doing now, which is really cool, is the idea that we're, like, explicitly training compensatory cognitive skills.

Because sometimes what happens is as we age, like, it's just natural that we're we're losing you know, parts of the brain as we age, we unfortunately know that.

But, we can do something called compensatory training. So there's an idea that, you know, you can still train the different neural circuits that are still, stable within the brain.

So you can use different strategies and tools to try to help you remember things. So, with my colleagues at UCLA and the Pacific Brain Health Center, we've developed a compensatory memory program that people do while they're on, a bike, on a stationary bike.

So it's this idea that people can be in an anaerobic state, but then they have a tablet and they're actually doing compensatory memory training drills where we created like virtual environments where people are, you know, at a barbecue and they're remembering people's names, and we give them strategies to remember their names and, and things like that.

So that that's been a lot of fun. And that research was funded by the NIH, and we should hopefully have those results sometime by the end of the year.

So I can share that with you and and your viewers. That's so exciting. Yeah, I think about kind of layering things on top, because I think part of a goal, like you said, compensatory mechanisms.

We know that there's going to be some decline, as we age. And if we have that great cognitive reserve, it'll be less than if we don't. But if we can, if the goal is executive function and independence.

Right. How do we keep you in your home for as long as possible, as independent as possible? How do we keep your driver's license for as long? Safely for as long as possible.

How do we keep you cooking for yourself for as long as possible? When you have that autonomy and independence, there's usually a lot more, you know, freedom, of course, but also mood is better.

There's less depression and anxiety. And what when I was listening to you talk about, you know, that higher order brain, the prefrontal cortex, that's where a lot of that executive function is happening.

And the more we can do to preserve, protect, enhance that function, the better off people are typically going to be as they age. Exactly. And I think that's just it speaks volumes about, you know, really the impact of exercise on the brain, because it really does seem to, preferentially, have the ability to improve the gray matter and the function and the structure within the prefrontal cortex, in the hippocampus.

And, I mean, this has been research that has been replicated for the last 30 years. You know, so it seems like there's something that's really sticking there, you know, that it's those two parts of the brain that speak really well together in terms of the areas we know that actually decline with age, but actually are highly plastic as well, too.

So it really just have besides is the fact that it's like, hey, if you take what we're saying to heart, you know, you can

actually do something to improve the fate of your brain.

And it doesn't have to go in this like linear downward trajectory, but you can actually try to course correct that with these different sorts of lifestyle behaviors.

And is it different for women than it is for men? We know that more women end up with Alzheimer's than men. Is there something going on there that maybe is structural in the brain or biochemical?

Yeah. I mean, there's a lot of, you know, theories around, you know, what might be happening in women's brains. And this is a huge area of research. And there's there's a wonderful researcher, that's at, Cornell, actually, that's looking at this and she's doing a lot of research in Pet imaging and different looking at different kinds of metabolism within the brain.

Because the interesting thing, about women's brains is that, yeah, we are wired a little bit differently than men. Springs. And unfortunately, Alzheimer's actually hits.

Yeah, two thirds more women than it does men, you know? So it's something that we need to be very, very careful about. And, women in their 60s are just as likely to develop Alzheimer's disease as they are breast cancer.

You know, throughout the rest of their lives, there's some studies that are pointing to the role of estrogen, you know, and maybe what's going on there, in terms of, you know, the onset of, of Alzheimer's and why that happens around menopause.

So actually, the research that's happening right now is looking at exactly that. So it's looking at perimenopausal and looking at through them, you know, through menopause and then after and looking at transition rates.

But that's obviously still a work in progress, which is you know, being being looked at right now. But but the cool part is though, that again, you know, the beauty of exercise really is that it specifically seems to have a beneficial effect for women.

They've they've done some studies. I can think of a study that was done with resistance training, and they had middle aged females. And they were actually showing that they had greater improvements in executive functioning after doing this resistance training intervention, than men.

So that was something that was really interesting. And then also estradiol as well to the dendritic spine density in the hippocampal neurons seemed to respond better, to higher estradiol levels in females, but not males, showing that that's another kind of sensitive area in the brain, for the hippocampus.

And then also the beauty and averaging as well too, that also has some, estrogen, you know, specificity for estrogen receptors on it as well, too, showing that, you know, it could be pointing to, you know, Bdnf as being a central mechanism for the improved fitness in females as well to, and and also the fact that the hippocampus actually do, the more exercise females do, seems to have this, what they call like a dose response to the more exercise women do seems to increase the hippocampal volume more.

## Combining Exercise with Cognitive Training

But you don't see that dose response in men, which is kind of curious. You know, you can't put that in a pill for me, so I can just swallow it. They tried to there was, there was actually a study that came out last year that.

Yeah, it was tried to tell like that, that exercise protein or something and put that in and so but yeah, I think the reality is it's like exercise is just so systemic.

I mean, it helps with like, you know, you know, blood flow and vascularization and all these other things that you can't really pin down to just one mechanism here now.

Oh. Unfortunately not. Well, since you don't do that, it sounds like we know a ton about what's going on, but there's always more in research that we want to know.

What are some of the big questions that you think are left unanswered at this point? Yeah. I think there's still a lot of work to be done around, you know, the, the actual dose of exercise, if you will, and how to prescribe exercise for people, you know, what kind of you know, genetic or, proteomic metabolomics sort of factors are going into it.

What sort of predispositions do we already have taking on a new exercise routine? How are we going to respond to it? This whole idea of treatment response responders and non-responders and who's going to have a bigger benefit, like how many patients should we be thinking about?

We really need to push for exercise, and maybe not so much these other things. And how do we temper that? So I think some of the research now, and we're trying to do some of this stuff right now too, is some of the exercise studies I'm doing is we're taking, you know, blood samples on patients and seeing their levels of Bdnf and seeing how they change during the course of the intervention.

And we're looking at things like norepinephrine, which we know is a really important, neurotransmitter for, attention and alertness in the brain and how that is changed with exercise.

So I think that's a lot of these, diseases they talk about, like precision, you know, medicine and precision psychiatry, you know, and how we can better design interventions.

So this idea that we're getting more of a holistic picture of the patients and really understanding that, you know, what I'm talking about, I, I see you shaking your head.

You're like, yes, I do this every day. But but making sure that we're addressing all of the factors in the individual. And this isn't just about, you know, getting bigger muscles or being able to run faster while, you know, but it's really about, you know, how can we address all of these systemic concerns at the individual level and prescribe better interventions for them?

And, there's even research being done, as I was saying, you know, what's the best kind of combination of exercises, you know, should should we be doing more like high intensity training?

Because that seems to have some sort of a differential effect in terms of glucose metabolism as well. And you can do it in, you know, a fraction of the amount of time it would take you to do a 30 minute exercise session.

You can do it in four minutes. You know, so there's, there's those kind of studies being done to and then, yeah. How do we include cognitive stimulation as well too.

Like how can how can we do that. Is there, you know, some sort of an app for that, you know, or some way that you can have people be able to do that at home, you know, because it's nice that we're hearing all this cool stuff in research, but what's something we can do practically, you know, is that, you know, me listening to a podcast on the treadmill, or is it going to be something that's probably a little bit more engaging?

That gives you feedback as well, too? So I think that's that's some of the exciting stuff coming down the pipeline. That is I mean, it's making me think of my patients.

Everyone's got a peloton this year, not everybody. But, so the people who can, got Peloton's this year and there's a screen in front of them and it's it that just seems like the next natural step that you would put something engaging, on that.

I, I'm trying to imagine if I were really exerting and then you started asking me to, like, do multiplication tables or something. I would just be like, no, no, I I'm I'm out.

Yeah, yeah. People engage because that's quite a bit of effort. Right. You're efforting physically and then you're

efforting mentally. And so how how do you not just, like, give up.

Yeah. No, it's actually it's interesting because there's like a whole area of psychological science about this. And they look at something called like the dual dual tasking trade off.

Right. So if the intensity of the exercise is two higher than your cognitive functioning goes down. So you kind of have to find that sweet spot. So, some of the stuff I've done is, creating exercise interventions where we get people with just a moderate level of intensity.

So just enough where you can't, you know, carry out a conversation, but it's enough where you can still be thinking, and then I deploy different cognitive stimulation on top of it.

But it's obviously been carefully thought out in terms of the timing because, yeah, you don't want to make it too hard, but there's also something, that's, you know, I called the neuroplasticity sweet spot where you have to be around 80% accurate, which is not too easy and not too hard.

So you don't want to be doing something where it's like, you know, Sudoku or crosswords or something because it's like, well, first of all, you can't do this when you're running.

You know, it's it's kind of all they're not really hard enough and they're kind of automatic. So you want to make sure you're going to give somebody stimulation that's going to be appropriate for their, their ability levels.

So you want to make sure that it's, adaptive. So there's different levels of, you know, easy, medium and hard kind of based on the individual patient and then also making sure that it's actually like training specific neural networks.

So I've created an app called Genius Gems, which is where we actually give people combined exercise interventions with different cognitive stimulation.

And the whole reason for this was because I've been in this research field for years and, you know, talking to patients and people just tell me, what am I supposed to do for my brain?

And it's it's been interesting to think about, well, like, there's, there's actually a way that you can contrive this environment like, yes, you can go dancing and taiji and boxing and everything else, which is great.

But like, how does somebody just go out of their front door and do something that can be cognitively stimulating, but like tempered for the individual level, and also knowing that it's supposed to be activating these networks in the brain.

So there's well known, you know, attention and memory and executive functioning networks. But yeah, how do you train those things? So the idea was just to make an app, an auditory based app that was going to make it easy for people to do this kind of an intervention, you know, 20 minutes, that's all you have to do.

And you're banging out your cognitive training and your exercise and and you're good to go. So, so that's been a lot of fun, too. It sounds efficient.

It also makes me want like my kids to do it. Okay. It seems like it would be helpful at either end of the spectrum or in the middle. Right. Like that you would benefit from something like that.

And if it's only 20 minutes a day that it's quite doable.

## Women, Alzheimer's Risk, and Research Gaps

It's very practical for either a kid or for, someone who's aging and struggling with dementia. Exactly. Like it kind of cuts across the spectrum. But, yeah, you definitely have to meet people where they're at in terms of the difficulty levels.

So, yes, I have my eight year old before he has a soccer game and I have been using the app, you know, I call it cross-training for the brain. So it's it's a way of.

Yeah, just trying to activate those neural circuits before you have to. Yeah. Either go do something important at work or, you know, or even if it's just.

Yeah, trying to, you know, keep your cognitive skills sharp. You know, there's, there's obviously different kind of clinical programs, but then there's also known as like optimizer programs.

So for like stressed out executives, you know, people that are dealing with, a lot, you know, it's teaching them, a different way to think because I think in today's society, what happens a lot is we do a lot of multitasking, which is really toxic on the brain, because it's basically you're just doing micro tasking all day long, like you're on your computer, but you're on your side and you're on your phone and somebody's over here and you're constantly being, you know, switched in different directions.

But this whole idea of doing, preprogramed dual tasking, which is basically the idea that you're doing something better, which would be like aerobic exercise, but then combining that with something that was strategically done to be a task based exercise, then it's not, then it's not multitasking, then you're actually consciously just doing things at the same time.

But it's in a way that was intended to be that way and not supposed to be distracting you in 50 different ways. But like trying to strengthen the ability to be able to do, this kind of combine training, that's really fascinating.

Now, you mentioned that you would have your son do it right before he played a soccer game, or you would have an executive do it right before a stressful meeting.

Now that's interesting because I would have expected the opposite. Right? Like that you would do it maybe a day before or the day or right after as a way to come down.

But no, this actually prepares you. Yeah. I mean, it kind of perpetuates the brain in such a way because I like to call it kind of this like neurochemical milieu that happens with exercise, you know?

So it's releasing different trumping factors and, you know, it's having this different, you know, release. It's a different sort of, metabolism and blood flow and things like that that are happening with the exercise.

So it's, it's really optimizing the brain to be in this state for learning and memory, and it's really priming it, if you will. So I like to do this is you know, like, I don't know, a brain break or something like that, if you will.

You know, like the ability to be able to prime the system or the pump, if you will, before you have to go do something else. And then you're kind of in this heightened state of awareness and challenge.

You know that whatever comes next is not as bad either, because you're more prepared for it. And they even show with just just exercise the benefits of it.

Last, the most important benefits are within that first hour after you exercise. So if you ever have to give, you know, keynote or something like that or you know, have some important meeting to go to, it's best to do the exercise first and then go do the event.

And they do that. They've done a lot of these studies with, learning as well too. So the idea that you do, you know, the, the exercise and then do the learning task that seems to be better than doing it after, it seems to help with consolidation.

Later on, because when you sleep, your brain consolidates everything. It seems to help with that, too. And, that's something I've looked at in my research as well, this idea of doing them separately or doing them together.

And there seems to be very different things that happen when you do them separately, versus having done them simultaneously. So when you do them separately, it seems to actually when you do the exercise and the cognitive training, it seems to help more, with a, a different kind of reasoning skill.

But then the simultaneous helps with memory, it helps with attention, it helps with a different kind of problem solving ability. So it seems to have more benefits.

Been doing them separately and it's time saving, which I think we all know in this day and age it's a benefit to be useful. Well, I'm so glad I'm talking to you today because I've been doing it all wrong.

I've been exercising after the stressful event rather than before. I mean, you could use exercise in many different ways. I mean, it's, it's multi-purpose, but for this specific kind that I'm talking about because definitely like, I definitely do different kinds of restorative exercise.

So after yeah, maybe a really stressful week I'll do like a slow jog, you know, on the beach or something. Whereas, you know, maybe on a Monday morning I would do more.

The two new students kind of combined workout, you know, is something that's a little bit more intensive, you know, so you have to temper it as well too, because you never really want to overwhelm the system.

And you have to really kind of tap into where you're feeling and what you're open to and receptive to at the time. But as long as you start slow and you just start integrating these tiny habits into your lifestyle wherever they fit best, that's the best advice I would have.

And then you mentioned you're developing the app. So is it available for people right now? Yes, it will be in the App Store in June, so it will be ready to go.

## Practical Programs and Where to Learn More

So I've been working on this for a number of years and finally gotten to a place where, yeah, it's going to be ready for, for the public. So it'll be in the Apple App Store and then also in the Google Play Store as well too.

And it's called Genius Service. And you can find this. That's so exciting. And then where else can people learn more about your research? And also do you do you see people?

Are you a clinician? Do you have a book, has tons worry about how people can learn more and just get the benefit of all of this really, really important information?

Yeah, and I can definitely share with you some some papers as well too, for for your listeners and your learners. But if you go to the Pacific Brain health.org so Pacific Brain Health Scoreboard, that's the website.

So I'm a clinical research scientist there. And that's where I'm working as I created a research department there where we carry out clinical trials and we're looking at different multimodal lifestyle interventions.

We're looking at this compensatory memory training, an exercise study. But there's also a neurology practice there as well too. So they're seeing, MCI patients, Alzheimer's patients, Parkinson's patients every day that come through there.

So really the research that I'm doing is in hopes of one day being able to be moved into the clinic and have, you know, lots of patients benefit from the kind of, you know, innovation we're doing on the research side.

And I'm sure the research that you're doing is already informing, to some degree what they're doing there. Absolutely. Yeah. So, yeah, we have a paper that's coming out in, Alzheimer's and dementia as well, too, where we talk about our multimodal lifestyle interventions.

So obviously exercise is a huge piece of it, but it's not the only piece of course, you know, so making sure that we're paying attention to our diet and our stress levels and, you know, there's different supplements and there's all kinds of different routines and things.

You could do to address multiple factors in your life. Exercise, you know, obviously being just one, but a very important one. So, there's some research out there about that, program as well, too.

That's so exciting. Thank you so, so much for sharing your time and your passion. This is just really exciting, an interesting work that you're doing and so, so important for people to know.

I, I as I mentioned, I, I'm so glad I talked to you today because I'm learning about how I can optimize the exercise I'm doing to make sure I'm protecting my brain personally.

And of course, that will hopefully impact my patients starting tomorrow. So I'm really happy to hear that that. So when you say, you know, if I'm a clinician, I like, well, I'm not a clinician, but I love to just be able to just profoundly impact patients care and patients lives.

So that's something that means a lot to me. So thank you for saying that. And it's been an honor to be here today and talk with you. So thank you. So inspiring. Thank you so much. Welcome to.