



Exercise For Enhancing Neuroplasticity And Alzheimer's Risk Reduction

Heather Sandison, N.D. interviewing
Sarah McEwen, PhD



Heather Sandison, N.D.

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

Dr. McEwen also serves as an editor for the peer reviewed journal "NeuroReport." She is also an associate professor in the department of translational neurosciences, and neurotherapeutics at the St John's Cancer 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 NIMH K1 and an NAR SAAD, Young Investigator Awards, and a prior primary investigator of a CTSI pilot study of a memory and exercise training program in older adults. She is currently a co-investigator on an NIMH R1 of exercise and cognitive training in psychosis patients and national Parkinson's Foundation Award, looking at the differential effects of motor and aerobic





fitness on brain circuitry in Parkinson's patients, with mild cognitive impairment. Dr. McEwen is also currently the primary investigator of NIA R21, 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, should prevent the progression to Alzheimer's disease. She's also passionate about advancing clinical care and treatment in an outpatient setting while also developing, studying, and implementing Novel Multimodal Lifestyle Intervention Programs. Dr. McEwen, welcome to the summit. That is impressive, by all.

Sarah McEwen, PhD

Thank you, and I'm sorry about that long introduction.

Heather Sandison, N.D.

I love it, I think I'm more and obsessed the more I learn about you and your passion and commitment, and just excitement around learning how we can prevent and reverse Alzheimer's is so clear, from all of the work you've done and just the quick chat that we've already had. So welcome to the summit.

Sarah McEwen, PhD

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.

Heather Sandison, N.D.

So one of your big areas of expertise is how exercise impacts the brain, let just start there.

Sarah McEwen, PhD

Yeah, I don't like to use this word loosely, but panacea is how I would describe exercise. There's really nothing I've ever seen, in all of my years of research of looking at how, activities can affect the brain and disease states and 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 would it work? Why is it so profound to us? And I mean, you can always think of it from an evolutionary perspective. I mean, it is who we are, there's really really, really cool book that came out quite a few years ago now, but it's called "Born To Run" And it's the book by Chris McDougall.





And he talks about this Indian tribe that lives in the Copper Canyons in Mexico called the Tarahumara. And it really looks at how the impact of their lifestyle has just incredibly reduce their risk for major illnesses that we suffer with in 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 mountainous terrains, and they have to run every day and they have to be active all day long, and it just shows that 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 that's been preventing them from getting sick. So taking that as a very lofty goal to be able to run 200 miles or something like that, but this idea that, 80% of our population doesn't even meet the lowest level of recommendations for exercise is just, it's disappointing, so I feel like as an advocate and custodian to science, that I wanna be out there and I just wanna be telling people how important exercise is, and it's not just something that you do to look good or something, but it really actually does have a fundamental level in your brain to be able to change the way that it functions to, 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, the activities that you do throughout your life can actually preserve your brain, even in the face of injury and insult, even as 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 consume your cognitive functioning. So there's many different layers we can talk about from neurochemical improvements to plasticity improvements to actually growing new neurons in the brain, I mean there's just so many levels that exercise acts that, that it's just like you, pick one and you'll find it,

Heather Sandison, N.D.

Circulation, great. 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 the science around that?

Sarah McEwen, PhD

Absolutely. So, I mean, it was really sad, but it was basically until the 1960s, I wanna say until a neuroscientist came along and was able to actually show that neuroplasticity still happens in the adult brain. A lot of people thought that what you were born with was the brain that you were essentially stuck with, and it was genetics that played into it. But actually the reality is, there's some thing 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 could think of neuroplasticity as being something that helps you form new connections in the brain, and 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 hardwired 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 Henry out of onprogue, 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 wheel and the cage, and they were running in there. So unlike humans, where you put a treadmill in the room with us, we hang clothes on it or something, the animals actually like to run on it. So they had them several weeks running on these wheels. And then they had another group that didn't have a wheel in there.

And then they looked brains, specifically the hippocampus in the brain, which is the learning and memory center in the brain. And they looked at 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 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 onto something in there and become integrated into the system is really important. So it's this whole idea of, not only growing the new neurons, but 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.

Heather Sandison, N.D.

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

Sarah McEwen, PhD

Yes, yes, it does, and I just wanna say too, both of them are equally important, right? So I think a lot of people prioritize like walking, 'cause it's really easy to do, you can just go out of the door





and do it, but it's almost just as easy to get some dumbbells as well too, or, get a virtual trainer or an app or something like that that can help you do some resistance muscle building exercises, because actually the American College of Sports Medicine actually recommends four different kinds of exercise. So aerobic, which is, you're walking and you're running and you're jogging and you're swimming, but then also resistance, so strength training exercises. So resistance machines, dumbbells, body weight, things like that. And then something called neuromotor or skill-based exercise. So this is one of, kind of one of more 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 Tai Chi 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 aerobically fit you are, and then also people that had high motor scale fitness. So this ability to do different kinds of 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 the wheel running, 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 higher order thinking parts of the brain, and then the sensory motor network too. So there there's been some really cool research on that.

And all of those areas I was just talking about, subserve memory. So aerobic exercise is really fundamentally trying to improve memory, for some reason that just keeps coming back again and again, in all of these research studies, be it brain imaging studies or behavioral, cognitive testing studies. It seems that people that have this higher aerobic fitness have better memory skills, larger hippocampuses, but then the different kind of fitness is that motor skill fitness. So that's the things I was saying, 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 of kind of low level sensory processing and memory functioning, motor skills is 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 movements that are all around trying to reach that goal with predetermined outcomes, you've got a lot of novelty that's happening to you a lot, and it's just, it's a very different kind of exercise. And with that one, we actually see more synaptogenesis 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 at a 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. 'Cause think about it when you're learning a new skill, you really have to think, not just when you're running, it's kind of an automatic movement, but when you have to do a new skill learning, it's a lot of the frontal cortex, anterior singulate, 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 landscape, if you will, for the different kinds of exercise and how they differentially affect the brain, pretty profoundly.

Heather Sandison, N.D.

That's really inspiring to get out there and 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 gonna 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.

Sarah McEwen, PhD

Exactly, exactly. But I mean, I could tell, I can say this for certainty. I probably get the questionnaire every day of like, "What's the best kind of exercise for my brain, Sarah," and it's like, well, I mean, I always started the place of saying, "Well, clearly, you have to do what you enjoy." I'm not gonna tell you to go do something that you aren't gonna find enjoyable. In addition to being a research scientist, I also did a fitness leadership program at UCLA, so I'm also a sort 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 a brain base coach. It's somebody that is able to understand where you're coming from and what you're interested in. So maybe it's volleyball that was your thing back then, but how can we think about integrating that into your life now? What other kinds of activities? Maybe it's ping pong, maybe it's gonna be something different, maybe it's a smaller scale, maybe it's the competition piece of it you like, or





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 I mean, there's a million things under the sun you could be doing, but including, in addition, so the recommendations that I usually have for exercise, are really doing aerobic exercise five days a week, at least 30 minutes, at least in modern intensity. I don't wanna be able to talk to you when you're exercising with me aerobically, that's a key right there, that intensity seems to, you have to really dial that in. You can't just be walking the dog, that's not gonna be intense enough, it's gotta be a little bit more. And then having two days of the muscle building, because we know as we age, we get sarcopenia, we get osteoporosis, so we need to make sure that we're doing muscle and building exercises at least twice a week, and doing at least six to eight different muscle groups for that.

But then for these neuromotor and skill sorts of things like the dance or the Tai Chi, I would also say two days a week too, of at least 20 minute sessions. So really this idea of doing multi-component exercise training too, then to just kind of layer it on a little bit more, what about the idea that you can make-? I don't wanna call it an artificial environment, but somehow that you could be adding some sort of another cognitive challenge to it. So obviously like with a sport, or with dancing or you're learning a new skill like that, clearly that's all novelty and that's doing some big 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 neurocognitive, computerized training before, that people do? Like pause it science?

Heather Sandison, N.D.

Oh yeah

Sarah McEwen, PhD

Dr. Michael Merzenich's work at UCSF. So his idea that, 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 activate those sort of neuronal systems seems to be really effective. But the problem with those, sitting day to computer playing video games thing is they don't really transfer very well to everyday life, it doesn't mean you're gonna forget where you parked your car, it doesn't mean that you're gonna remember, your daughter's friend's name or something like that. 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 explicitly training compensatory





cognitive skills, because sometimes what happens as we age, it's just natural that we're losing parts of the brain as we age, we all unfortunately know that, but we can do something called compensatory training. So there's an idea that, 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 aerobic state, but then they have a tablet, and they're actually doing compensatory memory training drills, where we created virtual environments where people are at a barbecue and they're remembering people's names or we give them strategies to remember their names 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 your viewers.

Heather Sandison, N.D.

That's so exciting. Yeah, to think about kind of layering things on top, because I think part of the goal, like you said, compensatory mechanisms, we know that there's gonna 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 freedom of course, but also mood is better. There's less depression and anxiety, and when I was listening to you talk about, that higher order brain, the, 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 gonna be as they age.

Sarah McEwen, PhD

Exactly, and I think that's just, it speaks volumes about, 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 and the hippocampus. And I mean, this has been research that has been replicated for the last 30 years, so it seems there's something that's really sticking there, 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 emphasizes the fact that it's like, "Hey, if you take what we're saying to heart,





you can actually do something to improve the fate of your brain." And it doesn't have to go in this linear downward trajectory, but you can actually try to course correct that with these different sorts of lifestyle behaviors.

Heather Sandison, N.D.

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?

Sarah McEwen, PhD

Yeah. I mean, there's a lot of theories around what might be happening in women's brains. And this is a huge area of research and there 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 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's brains, and unfortunately Alzheimer's actually hits yeah, two thirds more women than it does men, so it's something that we need to be very, very careful about it Women in their 60s are just as likely to develop Alzheimer's diseases as they are breast cancer, throughout the rest of their lives. There's some studies that are pointing to the role of estrogen, and maybe what's going on there in terms of the onset of Alzheimer's and why that happens around menopause. So actively the research that's happening right now is looking at exactly that.

So it's looking at pre-menopausal when looking at through them, through menopause and then after, and looking at transition rates, but that's obviously still a work in progress, which is being looked at right now. But the core part is though that again, the beauty of exercise really is that it specifically seems to have a beneficial effect for women. They 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 too, the dedenstic spine density and 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 BDNF gene as well too, that also has some estrogen, specificity for estrogen receptors on it as well too, showing that it could be pointing to, BDNF as being a central





mechanism for the improved fitness in females as well, too. And also the fact that the hippocampus actually do, the more exercise females do seems to have this, what they call like it a dose response, so the more exercise women do seems to increase the hippocampal volume more, but you don't see that dose response in men, which is kind of curious.

Heather Sandison, N.D.

Are you sure can't put that in a pill for me? So I can just swallow it?

Sarah McEwen, PhD

They tried it too, there was actually a study that came out last year that, yeah, I was trying to tell the exercise protein or something and put that in a pill. But yeah, I think the reality is it's like exercise is just so systemic. I mean, it helps with blood flow and vascularisation and all these other things that you can't really pin down to just one mechanism. So unfortunately not.

Heather Sandison, N.D.

Well, since you won't do that, it sounds like we know a ton about what's going on, but there's always more in research that we wanna know. What are some of the big questions that you think are left unanswered at this point?

Sarah McEwen, PhD

Yeah, I think there's still a lot of work to be done around the actual dosage of exercise, if you will, and how to prescribe exercise for people, what kind of genetic or proteomic, metabolomic sort of factors are going into it? What sort of pre positions do we already have taking on a new exercise routine? How are we gonna respond to it? This whole idea of treatment response, responders and non-responders, and who's gonna have a bigger benefit? 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, with some of the exercise studies I'm doing is we're taking, 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 has changed with exercise. So I think there's a lot of these, they talk about precision, medicine and precision psychiatry, 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 them, you know what I'm talking about.

Heather Sandison, N.D.

I know I see shaking your head. You're like, "Yes, I do this every day,"

Sarah McEwen, PhD

but making sure that we're addressing all the factors in the individual and this isn't just about, getting bigger muscles or being able to run faster mile, but it's really about, 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, what's the best kind of combination of exercises? Should we be doing more high intensity training? 'Cause that seems to have some sort of a differential effect in terms of glucose metabolism as well. And you can do it in 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. So there's those kind of studies being done too. And then, yeah. How do we include cognitive stimulation as well, too? How can we do that? Is there some sort of an app for that? Or some way that you can have people be able to do that at home, because it's nice that we're hearing all this cool stuff in research, but what's something we can do practically? Is that me listening to a podcast on the treadmill? Or is it gonna be something that's probably a little bit more engaging that gives you feedback as well too? So I think that's some of the exciting stuff coming down the pipeline.

Heather Sandison, N.D.

That is, I mean, it's making me think of my patients. Everyone's got a pelotons this year, not everybody, but so the people who can, got pelotons this year and there's a screen in front of them and that just seems like the next natural step that you would put something engaging on that. I'm trying to imagine, if I were really exerting and then you started asking me to do multiplication tables or something, I would just be like, "No, I'm out."

Sarah McEwen, PhD

Yeah





Heather Sandison, N.D.

People engage, 'cause that's quite a bit of effort right? Your efforting physically and then your efforting mentally. And so, how do you not just like give up?

Sarah McEwen, PhD

Yeah, no, it's actually, it's interesting because there is like a whole area of psychological science about this, and they look at something called the dual tasking trade off, right? So if the intensity of the exercise is too hard, then your cognitive functioning goes down. So you kind of have to find that sweet spot. So some of the stuff done is creating exercise interventions, where we get people at just a moderate level of intensity. So just enough where you can't 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 wanna make it too hard, but there's also something that's, I call it 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 wanna be doing something where it's like, Sudoku or crosswords or something because it's, well, first of all, you can't do those when you're running, but it's kind of all, they're not really hard enough and they're kind of automatic. So you wanna make sure you're gonna give somebody stimulation that's gonna be appropriate for their ability levels. So you wanna make sure that it's adaptive. So there's different levels of easy, medium and hard kind of based on the individual patient. And then also making sure that it's actually training specific in neural networks. So I've created an app called "Genius Gyms" 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 talking to patients and people just telling me, "What am I supposed to do for my brain?" And it's just been interesting to think about, well, there's actually a way that you can contrive this environment, yes, you can go do dancing and Tai Chi and boxing and everything else, which is great, but like how does somebody just go outta 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, 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 gonna make it easy for people to do this kind of an





intervention, 20 minutes, that's all you have to do and you're banging out your cognitive training and your exercise and you're good to go. So that's been a lot of fun too.

Heather Sandison, N.D.

It sounds efficient. It also makes me want my kids to do it. It seems it would be helpful at either end at the spectrum or in the middle, right? That you would benefit from something like that. And if it's only 20 minutes a day that it's quite doable, it's very practical for either a kid or for someone who's aging and struggling with dementia.

Sarah McEwen, PhD

Exactly, it kind of cuts across the spectrum, but yeah, you definitely have to meet people where they're at in terms of the difficulty level. So yes, I have my eight year old before he has a soccer game and I have you seen the app, I call it cross training for the brain. So yeah. It's the way of, yeah, just trying to activate those neural circuits before you have to yeah, either go do something important at work or even if it's just yeah, trying to keep your cognitive skills sharp, there's obviously different kind of clinical programs, but then there's also known as optimizer programs. So for like stressed out executives, people that are dealing with a lot, 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 your just doing micro-tasking all day long, you're on your computer, but you're on your slack, and you're on your phone, and somebody's over here and you're constantly being switched in different directions, but this whole idea of doing pre-programmed dual tasking, which is basically the idea that you're doing something meteoric, which would be like aerobic exercise, but then can combining that was something that was strategically done to be a task based exercise, then it's not 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 trying to strengthen the ability to be able to do this kind of combined training.

Heather Sandison, N.D.

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, 'cause I would've expected the opposite, right? That you would do it maybe a day before, or right after as a way to calm down. But no, this actually prepares you.





Sarah McEwen, PhD

Yeah. I mean it kind of perpetuates the brain in such a way, because I like to call it kind of this neurochemical milieu that happens with exercise. So it's releasing different choke big factors and it's having this different, release of the different sort of metabolism and blood flow and things like that, that are happening with the exercise. So 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 as a I don't know, a brain break or something like that, if you will, 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, that whatever comes next is not gonna be as bad either, because you're more prepared for it. And they even show with just exercise, the benefits of it last, the most important benefit are within that first hour after you exercise. So if you ever have to give a keynote or something like that, have some important meeting to go to, it's best to do the exercise first and then go do the event, and they've done a lot of these studies with learning as well too.

So the idea that you do 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 'cause 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, then the cognitive training, it seems to help more with 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 than doing them separately and it's time saving, which I think we all know in this day and age is the benefit too.

Heather Sandison, N.D.

Useful. Wow. 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.

Sarah McEwen, PhD

I mean you could use exercise in many different ways. I mean, it's multipurpose, but for this specific kind that I'm talking about, because definitely, I definitely do different kinds of restorative exercise. So after yeah, maybe a really stressful week, I'll do like a slow jog on the





beach or something. Whereas, maybe on a Monday morning, I would do more of the "Genius Gyms" kind of combined workout, as something that's a little bit more intensive. So you have to temper it as well too, 'cause you never really wanna 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.

Heather Sandison, N.D.

And then you mentioned you're developing app. So is it available for people right now?

Sarah McEwen, PhD

Yes, it will be in the App Store in June. So it will be ready to go. So I've been working on this for a number of years and finally gotten to a place where yeah, it's gonna be ready 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 Gyms" and you can find it there.

Heather Sandison, N.D.

That's so exciting. And then where else can people learn more about your research and also do you see people? Are you a clinician? Do you have a book? Yes, tell us more about how people can learn more and just get the benefit of all of this really, really important information.

Sarah McEwen, PhD

Yeah, and I can definitely share with you some papers as well too, for your listeners and your learners. But if you go to the [pacificbrainhealth.org](https://www.pacificbrainhealth.org), so [pacificbrainhealth.org](https://www.pacificbrainhealth.org), that's the website. So I'm a clinical research scientists there, and that's where I'm working as, I've 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 and 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 they 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 lots of patients benefit from the kind of innovation we're doing on the research side.



**Heather Sandison, N.D.**

And I'm sure the research that you're doing is already informing to some degree what they're doing there

Sarah McEwen, PhD

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 intervention. So obviously exercise is a huge piece of it, but it's not the only piece of course, so making sure that we're paying attention to our diet and our stress levels, 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 obviously being just one, but a very important one. So there's some research out there about that program as well, too.

Heather Sandison, N.D.

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

Sarah McEwen, PhD

I'm really happy to hear that, see when you say, if I'm a clinician I'm like, Well, I'm not a clinician, but I'd love to just be able to just profoundly impact patients care in 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.

Heather Sandison, N.D.

So inspiring. Thank you so much.

Sarah McEwen, PhD

You're welcome.

