Introduction to PEMF and Dr. Pawluk

Welcome to this episode of The Reverse Alzheimer's Summit. I'm your host, Dr. Heather Sandison. I'm really excited to introduce you to my friend Dr. Bill Pawluk.

He's an MD. and a holistic doctor near Baltimore, Maryland, and his previous academic positions at Johns Hopkins and the University of Maryland included training in acupuncture, nutrition, herbs, energy, medicine, homoeopathy, hypnosis, body work, and lots of others therapies.

But he's landed on PEMF as one of his favorite tools for helping people heal chronic disease. He's also written a great book called Power Tools for Health, and this year, Supercharge Your Health with PEMF Therapy.

So I'm excited for him to explain what PEMF is to begin with and how it relates to Alzheimer's and the brain. Bill, welcome. Thank you very much, Heather.

I really appreciate and look forward to our chat today and hearing about your adventures. Oh, thank you. So tell me, PEMFs get confused with EMFs. So there's pulsed electromagnetic frequency, and then there is electromagnetic frequency.

Can you help us understand what the difference is and if we should be nervous about either of them? I would generally say we should probably shouldn't be nervous anyway.

All right. Who needs that state?

PEMF vs EMF: Safety and Key Differences

Right, agreed. We don't want to worry about it. You know, if you do PEMF therapy, then you don't need to worry about it. Nice. All right. Unless you happen to stand right in front of the microwave tower that's transmitting at huge is right.

You're right there. Right in front of it. Well, okay, maybe, but the point is that they are different and they're confusing. So EMF stands for electromagnetic field and a lot of people do what you just did.

It's not frequencies. They just assume it's frequencies because you know, frequencies, because that's what 5G is. Frequencies so that we can, with most will say frequencies.

But it's electromagnetic fields. And I don't call them electromagnetic fields. I call them environmental magnetic fields. Is there any environment they're designed for a whole lot of different purposes than pulsed magnetic fields.

So EMFs are designed for communication. Right. They're not designed for therapy. So as a result, what happens is we get confused that now PEMFs, very different EMFs are broadcast into the environment.

They're sent out like light waves, like radar, like television signals and radio signals that broadcast 360 all over the place. And that means that they are basically what we call an open loop.

They go out into space. They're distributed. I'm sorry about this. Are you having electromagnetic fields coming at you? These are the way that I. Don't worry about it.

I'm going to put it on airplane mode so you may have to chop this section out. So basically then EMFs are broadcast. And there's one important characteristic about EMFs, too.

They tend to be high frequency. So I thought I had to silence this. So what is going on here? I'm through. I can't

hear them. Bill. You can't hear them? No.

But I know it's distracting for you. Well, if you can't hear them, then I hope that nobody else can hear them. Anyway. Okay, so. So EMFs then basically are high frequency.

High frequency is not good. We use high frequency in medicine to burn tissue, to coagulate tissue. Right. To get rid of warts, to destroy nerves in the back.

That's called radio frequency. And EMFs are basically like radio frequencies, extremely high frequencies. What that means is those wavelengths are extremely short and they're absorbed by the body.

That's the principle behind a microwave oven. Right. We are cooking stuff. So EMFs is basically microwaves cook. So when you take a cell phone and you put it in your ear, you're cooking.

And you notice when people take the cell phone away from their ears, their ears are often bright red, especially the longer it's been there. The other ear turns a little more red because of reflex vascular changes in the body.

But this one is very red. And if you do this all day long with the cell phone to your ear that's broadcasting and receiving, then you're essentially cooking that side of your head.

And we now know that there's an increased risk of acoustic neuroma in people who have a cell phone to the side of their head for long periods of time, not over a day or week.

You know, you're talking about months usually. And there are people who go around with cell phones attached to their heads all day long. So we should never be doing cell phones to our heads unless they're on those air tubes.

Earbuds are better, wi fi Bluetooth is better, but it's still a broadcast being broadcast. So what happens then is that that's cooking as well. You know, it's not good for you.

Now, PEMFs are not designed for communication. They're designed for healing. They're designed to help the body. And major difference is that one is broadcast in the environment, as we call it, open loop.

And the other one is, this is my my my thumb is the wire that carries the current, that produces a magnetic field. And this is called the right hand rule.

So that's the wire. And every time the current goes through that wire and it can pulse is a pulse of the magnetic field. So that's that's why it's called pulsed electromagnetic.

So every time there's a pulse, there's an increase in the magnetic field perpendicular to the flow of the current. And what happens is that current, it goes out and comes right back.

Goes out and comes right back. Yes, it goes out into the environment, but it collapses right back on itself with every single pulse. It's not going out into space.

Right. It's a closed loop, that current in that wire that controls that magnetic field policy. So it's designed then to pulse into the body and then when it passes into the body, it creates charge in the body.

So that electric are the magnetic field is a principle of physics called Faraday's law. And Maxwell's equations. And so there's physics associated with all this.

And according to Faraday's law, Faraday discovered this himself in the 1800s. When you pass a magnetic, pulsing, magnetic current past, a wire are coil wire with a light bulb attached to it.

Using PEMF for Brain Health and Alzheimer's

You pass the current through it. Light bulb lights up. That's it. You don't need to plug it into the wall. You don't need to have current coming into that light by a light bulb.

It just magnetic field causes current to flow in that wire, which then causes the light bulb. So what does that do in the body? In the body? It's causing charge in the body.

And then that charge in the body is used by the body. That extra energy is now used by the body for all the things it wants to do with it, what it wants to do with it.

Now, what the magnetic field wants to do with it, what it wants to do it. So the body is in control. And we know that Magnetic Fields. In my books I talk about the actions of magnetic fields physiologically increase circulation, decreased inflammation, stimulating stem cells, basically helping the acupuncture points in meridians in the body.

It balances the acupuncture points in meridians automatically. That's why these very low intensity magnetic fields work is because they're working on the acupuncture system.

They're not strong enough to heal deep in the body. We'll get into intensity shortly. So as the magnetic field pulses into the body, like the wind flowing through the trees, you know, the wind's there because the leaves are moving.

It could be a week wind, it could be a breeze or it could be a very powerful wind. And same thing with magnetic fields. It can be very powerful and create a lot of charge in the body.

Virtually magnetic fields are generally extraordinarily safe. And so why are they helpful against EMFs? Because they do all this stuff to help the body be healthier and to be able to react to the environment in a very safe way.

So that means that basically magnetic fields are making the body resistant to the effects of these external magnetic fields, environmental magnetic field.

Again, when you're standing in front of a microwave tower right in front of it, then you better be blasting yourself with PEMFs at the same time. All right.

But generally speaking, we're surrounded by EMFs, but they're relatively weak. So if we're doing magnetic field therapy on a regular basis, we're basically just body's brushing it off.

It's just not not a big deal at all. So what about when it comes to the brain? You mentioned these benefits of increased circulation, of reduced inflammation.

These are things that come up a lot when we're talking about the causes of Alzheimer's. Is it safe to have a PEMF pointed at your brain? Very good question.

So there are FDA approved machines. I don't know if you care about the FDA or not, but, you know, there's a process that you go through to prove that what you're claiming is truly happening.

So, in other words, I can't make a claim with the FDA. I have to prove it that it's actually doing what you're saying it's going to do. So the FDA has approved magnetic therapy devices to treat the brain.

It's called RTMS or TMS transcranial magnetic stimulation. And these are high powered machines. And how do they work? You actually put a coil up against the head over the motor cortex.

Right. So right here is what we call the motor strip. Of the right ear. Above the ear. So that motor strip basically is what controls our hand movements and our body movements.

So the brain tells the body move. It tells the body which part of the body to move and how much to move, and so on. So the brain is doing that. So what happens is that if you put a coil over that area and you turn up the intensity really high, you can actually cause contractions of the opposite hand.

And they actually do that on purpose. They stimulate the brain, and that's called the motor threshold. So the branch is stimulated now and then had moves like that's called the motor threshold.

So now what we do is move that coil the front of the head to treat for depression and we actually increase the intensity by another 20%. Wow. So this is significant.

It's huge. And pumps were developed to basically undo the need for convulsive therapies, ect. Electroconvulsive therapy, right. For treatment, resistant depression, for psychosis, for other needs.

So magnetic therapy undoes that horrific way of treating the people, which causes muscle spasms. It's actually causing a major seizure. Right. So magnetic field therapy has replaced it.

And now you have a tool that you can fine tune a contraction in a part of the body. But you're not going to continue to do that. You're not going to keep going back to the motor cortex to do that.

You go to other parts of the brain that you're treating that for specific purposes, like treating depression. But then you can use it for Alzheimer's, you can use it for Parkinson's and M. S.

and neurodegenerative brain injuries. Basically anything that's going on in the brain that's not healthy. But even even a healthy brain wants to be even more healthy, more active.

You can use PMF to do that, too. So at a cellular level, what's happening here? Okay. So in the books, both books, the Power Tools book and the and the Supercharge Your Help book, I outlined the different actions of magnetic field, so we mentioned some of them improved circulation, reduced, inflammation increased, so oxygenation to the brain.

And Chris, oxygen delivery to the brain increased, electrical responsiveness of the brain controlling the brain frequencies. So if all of a sudden the brain has more juice in it, if you will, right, then the brain can function better.

You can control frequencies, you can stimulate stem cells, so you can actually stimulate brand repair. And then there's this wonderful term called plasticity.

How PEMF Affects Brain Function and Neuroplasticity

So PMF increased brain plasticity, they increase the ability of the brain to take in new information, process it, and then produce a value from it, produce some kind of action that you might want memory, for example, or mood changes, for example, or focus or concentration or sleep for that matter.

So you can do all of these different things just by stimulating the brain in the right way. And so, again, at 27 to action, there's no point going through all the different actions of them.

But circulation is a big one. Inflammation is a big one. Increased plasticity is a big one. Gene changes is a big one. STEM cells is the big one. All of these are done by the perhaps I should have done by the brain.

And if all the PNAS are doing stimulating the brain and the branches. Okay, I need more stem cells or I need more circulation or I need more anti-inflammatory action or I need more calcium movement in the brain, whatever.

So the brain decides what it's going to do with it. And they hope our listeners understand what's the difference between this and like neurofeedback, for example, and what effect does PMF have on brain waves? So I've been trained in neurofeedback.

I have a lot of neurofeedback equipment sitting there gathering dust. I was intrigued by neurofeedback. I thought, well, with neurofeedback I could really make a difference.

But I discovered that neurofeedback typically is very relatively passive and it's very slow. Takes a lot of sessions

most of the time it takes a lot of sessions.

It could take anywhere between 20 to 50 to 70 sessions of neurofeedback. I've had patients have 90 sessions of neurofeedback and not have any benefit.

And not any benefit because what the neurofeedback has to do is it has to reposition parts of the brain and the brain's functions. But then that repositioning of brain functions is in an environment of a brain that's fighting against it, is try to do something else.

So what I realized is with the frequency changes with PMF, I can fight with the EEG, quantitative EEG, so I can do a brain mapping, right, to say, well, this part of the brain has too much better.

This part of the brain has too much alpha. This part of the brain is too much delta and so on. So say those parts of the brain that have too much or too little, we can then to the brain with PMF therapies into those frequencies that relate to those brainwave patterns.

So you can restore the brain like that, and you may only need five or ten treatments. Now, if you combine therapy with neurofeedback or other neuroplasticity, work, it'll work much faster, much better, much faster.

Wow. Okay. And I'm sure if you combine it with enough nutrients and enough sleep and some of those. What's the you can't build a house without bricks and mortar.

Right. You have to have the nutrients. You can't fix something that needs calcium or it needs proteins or it needs fats. If you don't have those basic substrates in place, then the body, the brain in this case does not have the equipment or the tools that it needs to be able to do the fixing.

And then so you have fix the basic function. They are basic supplies to the brain. Then you have the functional parts of the brain, but then you also need to stimulate the you need to activate.

And that's where neuroplasticity comes in. You have to activate the brain. So if I want to build memory, what do I do if I just sit there? Okay, I'm going to build memory.

Where's the memory coming from here? I can see memory. Where is the memory? So you have to do something to produce the memory in the brain. You have to give the brain the memory that it needs, but you need the plasticity and you need the circulation, and you need a healthier, functioning brain that would take that memory consolidated, put it into place, and then be able to allow the brain to pull it back out when needed.

Right. So PNAS work along that whole that whole spectrum, the whole process. So magnetic field therapy activates the nutrients, it activates and amplifies the anti-inflammatories, it improves the neuroplasticity of the brain and wakes up.

So, okay, now I have okay, I have energy. Now I can do my job. I can learn. I'll give you an example of brain stimulation. We have a machine called the Flex Pulse.

It has a bunch of I just I have to design the flex pass based on my training and their feedback. I say, okay, I want Alpha, I want beta, I want Delta, I want Gamma.

I want all these different frequencies. But individually I don't want it to be jumbled. Can you describe the brainwaves and what they kind of like? Beta?

I think of beta as being a little bit more excitatory, a little bit more stressed maybe. And then theta is very creative, very relaxed state. Can you just kind of break them down for us real quick so that people know what you're talking about there?

Sure. I think you're very important, actually. And then when it comes to Alzheimer's, again, that's even more

important in many ways. So let's start with Gamma Gammas and more recently discovered brainwave patterns.

So Gamma is where the frequencies of the brain are moving from the back to the front. Gammas High frequencies, 40 hertz, around 40 hertz, purporting to be maybe around 100 hertz cycles per second.

So so the brainwaves are in patterns, they are in waves. I like pumps, the brain is in waves, but PMS coming into the brain at a specific pulse rate begins to move those frequencies in the brain into whatever direction you try to coax it.

Brainwaves, EEG, and Alzheimer's Patterns

You can't control it, but you can call it. So what happens then is beta. Gamma is very high alertness, very high awareness. It's integrated. It's taking all these inputs, the sensory inputs typically that we have into the body, whether it's sound, light, color, heat, whatever, any kinds of sensory inputs, and it's integrating those sensory inputs and distributing them into different parts of the brain.

So people who do a lot of meditation are often in 40 hertz, they're often in gamma frequencies. Professional meditator people who do a lot of meditation are often their brains are cycling at 40.

So their brains are like optimized in a sense, the next level down, if you want to call it down, but the next level in frequency is beta. So beta goes from something like 13 hertz to 23 hertz approximately, or let's say up to up to 40.

So that's alertness. You're in beta and hopefully the people in the audience who are listening are in beta. They're integrating, they're listening, they're learning, they're processing their understanding.

They're trying to memorize. That's big. That's alert consciousness. All right. Doing doing arithmetic, doing your your QuickBooks, doing your analysis and reading and integrating and writing a paper that's beta.

Then we have essentially we have alpha. Alpha is basically what I call a neutral state. Or I watch a dog or a cat just sitting there. Eyes are open and they're sitting there and they're looking and they may be scanning their eyes, maybe moving back and forth.

You know, they're just taking it in. They're not planning anything. They're not hungry. They're not going to somewhere to eat. They're just watching. That's the observer state.

So when we're an alpha, we're relaxed. It's a relaxed state. It's not asleep and it's not alert. It's waiting for input, essentially. And we we go from that and down to do so.

So Alpha then basically is from about eight hertz up to about ten or 13 hertz below that is theta. So theta is the primary frequency for us to fall asleep.

And a lot of people who are doing meditation are often in theta. We have to talk about doing meditation and gamma. That's very interesting. I'm in Delta meditation at Delta.

That's very interesting. So theta is meditation slightly to your head. When your head hits the pillow and lights out, the next thing you know, you're awake to go to the bathroom, but you sleep for 3 hours.

That's theta. Now below theta is delta. So theta is from like five hertz to eight hertz. Delta is from one hertz of zero is dead. So it can't be zero.

No one that. It's got to be better. It's got to be more than that. So so Delta basically is like one let's say let's say one hertz up to about five hertz, 4 to 5 hertz.

So those are the different brainwave patterns and different parts of the brain are in different brainwave patterns. Our whole brain is not always in beta or is it always in delta or in our theta, etc.

We have different parts of the brain that are different frequency sets and they're designed to be that way. The brain has been designed to do that kind of integration with different frequency patterns.

And this is what we would measure on, say like a an EEG. Or a quantitative EEG where we do the brain mapping. And yes, that's what we measure with the EEG.

There's 12 leader, three lead or whatever number of leads you have correct. Okay. And then in Alzheimer's, what are the typical patterns that show up?

I think it depends on severity. So it's like A. D. D. or autism. An agitated Alzheimer's patient is going to be in beta? Probably not. Probably not in gamma because they're agitated, agitation sort of and does a whole lot of other stuff.

So if they're agitated, they're in beta, if they're sitting there just like a dog or a cat looking into the environment that basically, you know, bleary eyed, bleary eyed, while they're probably an alpha go alpha, maybe even in high beta.

So Alzheimer's, depending on how badly they're affected, they can be across a whole range of frequencies and they are more likely to have more dominant amounts of frequencies for longer periods of time.

Early Alzheimer's is not it's a memory problem most, but severe Alzheimer's or severe dementias. The brain is sort of taken over when we have somebody with a brain injury or somebody with encephalitis and they're basically in coma, there's a good chance that most of the brain function is going to be in doubt.

When you see a normal person, when you did a EEG and they're almost all delta, all their brain is essentially shut down. Hmm. Okay. And what would cause that?

And again, what could be severe head injuries? It could be infections, it could be toxic toxins or toxicities where you have so much cellular damage in the brain that the brain is just shutting down its functions.

This is not that common. We don't really see it that commonly, but obviously in the hospital settings you're going to see in these kinds of people very frequently you'll see that kind of level of brain function in Alzheimer's units, in dementia units.

They're nearing the end. So the brain is beginning to just sort of shut itself down. And so applying PMF to this sort of dysregulation, if you will, work, can we expect to see?

Well, again, there's a spectrum from for mild. So you can say mild cognitive impairment is an early component of the progression potentially of Alzheimer's.

Now cognitive impairment, mild cognitive impairment is a pretty common stage for 50 year olds or six year olds. You know, you go to a room, you forget why you went there, right?

You you're distracted by something and all of a sudden the memory is gone. They didn't the memory didn't lock in. So that's at the very earliest stages of it.

But if you do a therapy with mild cognitive impairment, a certain percentage of those individuals are going to end up having Alzheimer's. They progressed. That's a progressive disorder.

And if they have the apple poor gene and if you have a bad diet and you have a lot of inflammation in your body, if you're not getting enough rest, if you're not getting enough activity or exercise, but you're not getting enough stimulation, all of these things tend to cause depression of memory and contribute to mild cognitive impairment.

So if you're doing brain stimulation with a therapy, you can stimulate the brain to specific frequencies, but you can also just produce like a RTMs.

Choosing the Right PEMF Device and Intensity

You can produce a specific brain stimulation that just wakes the brain up. In general, PMA therapy can also make the brain sleepy. A lot of people who do up therapy at bedtime just zonk out.

When I do whole body pe about therapy, I get very relaxed. I can't read. I don't want to read. I don't really care. Right? I started producing a lot of endorphins and explosions and serotonin and I just don't really care anymore.

So that's a good place to be now. And then when. You want to go to sleep. Especially when you want to go to sleep or if you want to have a nap in the afternoon or you want to veg out, you want to go into a just a very relaxed state, just tune out for a little while and recharged, regenerate.

So in the earlier stages of dementia, then you start to have more significant memory changes and you may have behavioral changes as well. Then you start to have problems with anger.

You have problems with reactivity to environmental stimuli. You can overreact. So there's a progression. So the sooner you start with chemotherapy in this process, the slower, the more you can slow down that progression.

So not only can help with memory, the medications for Alzheimer's disease only help you with memory, right? They basically don't help you with with repair or to stop the progression.

All right. They just basically catecholamines. Just basically just just help the memory process temporarily and partial they're talking to accidentally, right?

Yeah. So pain therapy combined with nutrition, combined with brain exercises, all of these things work together. And chemotherapy enhances everything you do, makes everything you do work better.

Got it. Well, that is exciting and very hopeful. And so how did people find out about getting the right PMF device for them? Because there's a spectrum of these devices as well.

There's a huge spectrum and it's very confusing. So actually, if you go to Dr. Polycom to my website, DARPA Outlook.com, you'll find a huge number of resources about what PMF could do.

We mentioned the two books, so if you want to geek out a bit, there's 500 references. You can find out the science of it with power tools for health. It's got practical information, too, but not as practical as the new book Supercharge Your Health, which describes the mechanisms of action.

But we now get into in the Supercharge Health book, I get more into what kind of device should you consider for different kinds of problems. So as you review any different health conditions and make a recommendation for the kind of advice, it's going to work best for that condition.

So you can have local magnetic field therapy that just treats face tennis, elbow or carpal tunnel problem, etc., or lower back. And they're very inexpensive, typically much more, much less expensive.

Now, when you want to do more in-depth treatment like a brain, now you need higher intensity. So why do you need higher intensity? Because magnetic field therapy drops off in intensity, just like light and cold and sound farther.

You are away from that stimulus and the more rapidly it drops off, it drops off extraordinarily fast. So if you want to treat the brain and we want to reduce inflammation, so to reduce inflammation in the brain, which is a common cause of Alzheimer's, right.

If you want to reduce inflammation, you want to treat across the brain. So 4000 Gauss magnetic field on one side of the brain will drop off the 15 on the other side of the brain.

So 15 Gauss is the optimal level of magnetic field stimulation to reduce inflammation through the adenosine receptor, and that's covered in the Supercharge Your Health book.

There's an appendix about that. It's also on the website if you want to do a search on that, you can do a search on adenosine inflammation and pain, and it gives you a tables on what kind of magnetic device you need for the intensity or where you're trying to treat.

So you have to figure out where you're treating. You have to know where you're treating. And then you then you pick the right machine that's got the intensity that you need to start with.

If you're training again, an elbow for a tennis elbow, all you need is about 15. Gauss may get by with $40 or 50 Gauss, but you may need something stronger.

So if you're concerned about Alzheimer's disease, then you need a more high powered machine. You can do something to stimulate the frequencies that we talked about.

So one of the stories that could tell you is I had a machine that was only about 200 Gauss and I had to pick up my daughter at the airport at 2:00 in the morning.

She was supposed to come at 830, but she her flights got delayed because of weather and try to pick her up at 2:00 in the morning. And I need to do my job in the next morning.

And so at 2:00 in the morning, do I drink coffee or do I get road drowsiness? And I start to nod off because I had to drive 50 miles each way. So I said, okay, well, I have the right tool PEMF therapy.

So the Flex Pulse has a 23 hertz frequency as a 23 hertz program. So I put one coil of flex part at the back of my neck behind what we call the reticular activating system, which is one of the alertness control systems in the brain.

And it was like, okay, I'm awake. I wasn't, but I wasn't jazzed up like you would with coffee. And as soon as you stop it, the brain reverts back to where it wants to go.

So I was alert the whole time. I went to get my daughter, drove back. No problem is no nodding off at a stimulating conversation with my daughter. And then as soon as I got home, I took it off and within 10 minutes, I was in bed.

Wow. Oh, and did you feel okay the next day? Oh, great. But magic, it sounds like complete magic to be able to be awake when you want to. And then jetlag.

I want to take it with me on my trip. It's only for jetlag. I have a frequency I call flying delta, so fresh for flying across the country.

Real-World PEMF Examples for Alertness and Anxiety

And you, especially if flying back east, you're going to go with the wrong way through the time zone. But yes, the flex pulse allows you to pick the frequency that you want to do what you want with the brain.

So if you want to be asleep, you should be using Delta and want to be alert. You should be using beta. If you want to just be relaxed, tune tuned out then use alpha, right? If you're a very anxious person.

I had a patient who saw me who was very, very anxious and she had a one hour visit schedule. She walked in, she sat down and literally within two or 3 minutes, she started pacing, got up, started pacing thing.

Really. She was extraordinarily anxious. So I said, okay, I'm going to treat her with Magnetic. I pulled out my flexible sweater, the back of her neck like I did for waking this case.

I put her on theta. I wanted to decompress out, want to crash her quickly right? So she put on the back of her neck, continued pacing, and literally within two or 3 minutes sat down on the chair.

I could see the elevator going down. Wow. And she didn't have to swallow a pill, take a drug, take anything with

side effects. Exactly. So I asked her at the end, what what was your stress level when you first sat down out of ten and she said seven?

If somebody asked me, I would have said 13. About her. Or her exact, you know, so at the end of the business said, well, what are you now? She she's three. She was delirious.

She was really happy. So she bought a machine so she could deal with her anxiety, you know. And gets a movie. Yeah. So that's how quickly you can change the status of the brain.

In terms of the brain, we're very safe. About how incredible and we know anxiety has a lot to do with Alzheimer's as well. That really sets us up. If we're in a high stress state all the time, our brain doesn't get a chance to recuperate, recover, get, get all of the benefits of of a more relax, a rest.

Digestion heals. You're overstimulated by adrenaline. You're not producing enough parasympathetic balance to your brain and that the adrenaline. And then over time, because it's a major stressor, it causes increases in cortisol chains, changes basically the brain frequencies and patterns.

It tires out the brain, essentially. Yeah. Yeah. And there's direct implications for the hippocampus structurally as well as the amygdala and the limbic system.

So when you're stressed, you don't remember. Right? I mean, we've all had that experience of stage fright, that classic example. But there's a lot of others and many of us can recall that time that we felt felt stressed and couldn't recall our words, can recall somebody's name, and then that over time.

Entering into memory impairment, if you're entering into early Alzheimer's or mild cognitive impairment, then reducing stress is a major, major tool to help you maintain memory.

Wonderful. Well, that is so hopeful and so exciting. So drpawluk.com, right is where people can find out more and then your two books so you share the names of those again.

So the one I would recommend the most is the Supercharge Your Health with PEMF Therapy. Fantastic. That's got the tables and the protocols and it's got a lot more practical information has no science.

If you're if you want to be geeky in order to really read the science. And I would suggest you get the other book, which is Power Tools for Health. The combination is very helpful because you don't have the protocols in the Power Tools for Health book.

Okay, great. So get them both and geek out with Dr. Pawluk and get your brain healing with PEMF. I love it. Thank you so much, Dr. Pawluk. It's a pleasure to connect with you every time.

I so appreciate your wisdom and enthusiasm for this. It's infectious. Thank you. Thank you. I don't need to be infected as well with memory.