

The Concussion Repair Manual: A Practical Guide to Recovering from Traumatic Brain Injuries: A Special Interview With Dr. Dan Engle

By Dr. Joseph Mercola

JM: Dr. Joseph Mercola

DE: Dr. Dan Engle

JM: Hi, this is Dr. Mercola, helping you take control of your health. Today we are joined by Dr. Dan Engle, who is board-certified in adult psychology and neurology. He completed psychiatric fellowships in child, adolescent and forensic psychiatry.

He has a very interesting book about something that most of us watching this have experienced personally in our life, which is, as an acronym, called TBI, or traumatic brain injury. It's pervasive. Obviously, it's not the extremes we see in war victims or people with sports injuries – football players and boxers – but it still happens. Dr. Engle has had personal experience with it, which is what passionately motivated him to pursue this discipline and write a book about it. Welcome and thank you for joining us.

DE: It's good to be with you today as well.

JM: Why don't you expand a bit on your history that I briefly summarized and explain your motivation for writing your book?

DE: Yeah. I went to college to play soccer. I didn't really know what I wanted to do after that. I had a series of concussions that led up to me choosing medical school to orient towards, potentially, surgical medicine or emergency (E.R.) medicine.

Two weeks over in medical school, I broke my neck. That was kind of a big entry point in a recalibration of my direction. After I broke my neck, they gave me the option of holding out a year or going and starting with my current team. I went ahead and started in one of those big contraptions called a Halo Device, where they screw it into your skull and you're walking around fixated. For the first three months of med school, I was in this Halo. It was the first thing that finally slowed me down. It helped me self-reflect. It helped me realize that I was just driving such a level of intensity in my life that I didn't really enjoy.

I ended up having much more fun in med school and residency than I did in high school and college, just because I wasn't so intense with everything. It oriented me from E.R. and surgical medicine into neurology and psychiatry. It was more around like the neuro-reparative aspects of brain injury and spinal cord injury, as well as the more humanistic side of understanding people, the stories of what make us who we are, and the mindset of healing and how very pervasive that is to recovery.

JM: Yeah. I alluded to the fact that it was pervasive. Certainly hardly anyone watching this has gone through an experience like you, having to wear a halo for a significant amount of time. But

thank god that technology exists because you were able to function. Why don't you review how common this is and some of the examples that can cause this? Because my guess is it's like 80 or 90 percent of the people watching this have had some form of TBI.

DE: Agreed. They probably have a significant TBI themselves or they know somebody who has. It is consistently interwoven through the fabric of our culture. Unfortunately, the current awareness of its prevalence is outdated. The current definitions are evolving, and yet many professionals in the field still have old nomenclature and old identification.

I was just talking with a client the other day. Two different professionals in the field – one head of a neurosurgical unit in one of the northern states, and the other head of a rehab center – had both told her – She had played ice hockey through college, had known significant sequelae, including three significant concussions, but each of those physicians said, “Well, you haven't had a concussion because you didn't blackout.” That's not at all the case. That's actually what a lot of people think. “Oh, if I didn't have a complete loss of consciousness, then I didn't have a 'significant head injury' or concussion.”

When we start to recognize that old definitions no longer apply and we need to keep up with the new science, we see that there are millions of people who get documented TBIs and concussions every year. The numbers vary, as numbers do vary when we're looking at broad epidemiological studies. Somewhere between 4 and 6 million people are walking around with a chronic severe sequelae from TBI on disability. The number of unreported TBIs and concussions is upward of 70 plus percent every year. A lot of people experience them. Most of them are mild. Most of those will heal on their own.

The old adage, “Go home and rest. It'll be okay,” has some merit. But when I had my concussions, and the last of which was after I broke my neck – I got turned upside down in a snowboard park. It put an 8-inch crack on the back of my helmet – I knew something was off, because I had problems with attention, focus, concentration, memory, sleep, kind of like the classic post-concussive syndrome. My neurologic attendings at that time said the same thing. They said, “Go home. Rest. We hope it gets better.”

This was 20 years ago. We didn't really have appreciable technologies and therapeutics to heal it. I put myself in the lab. It wasn't fine for me that things were just going to continue to be like subpar. I wanted to try everything out. I put myself in the lab, see if it works or if it didn't work. The things that worked for me or had worked significantly for friends, family and clients are the things that I ended up putting in the manual.

JM: Yeah. You were essentially an early biohacker.

DE: Yeah.

JM: A biohacker needs good quantitative tools. Were you using an electroencephalogram (EEG) to determine the effectiveness of your interventions?

DE: I was not at that point, which is a good question. I was using mostly subjective internal experiences and objective, whether they were written tests, performance exams or my ability to perform in the field, in the ring or kind of like in the movement sports, or feedback that I was getting from my own network. Like, “What’s my mood like? How is my energy level like? How is my irritability?” Because we don’t always self-observe that well.

JM: Sure. Most of the time, that’s the case.

DE: Most of the time. Particularly when we had a head injury, it’s even harder to track and have that kind of witness perspective.

JM: Oh, sure. Would it still be accurate to use the term “concussion” or is that a sort of antiquated technological term now? Maybe [it’s] more precise to refer to it as TBI.

DE: The question about concussion versus TBI, as far as nomenclature, is a good one. Generally, concussion equates to mild to moderate TBI. When we get into the more significant TBI, severe TBI, then we’d start to use that term, because that has kind of a level 1, 2 and 3 series.

JM: Okay. Why don’t you discuss some of the ways that people watching this might know if they’ve actually suffered a TBI? The reason that this is important is because unlike 20 years ago, when you went through your trauma, there are some very effective interventions and strategies that you can use. Lots of them are pretty simple and effective. It doesn’t require a lot of money. They just have to know they’re existing and use them. What would indicate, to someone watching this, that they may have suffered a TBI?

DE: Great question. It does also relate to the *Zeitgeist*, the cultural kind of framework in our system, where usually concussion or traumatic brain injury is equated to a really bad loss of consciousness or combat sports. Many people who I work with are not in either of those camps. They may have had a mild to moderate TBI or concussion from a car wreck or from walking down slippery ice and falling and bonking the back of their head.

Sometimes it doesn’t really seem like the injury would have been that significant, and yet afterwards, there might be issues with concentration, mood, focus, the executive functions here in the prefrontal cortex that allow us to pay attention to what we’re doing and shift sets between activities, and to be able to lock onto a target and stay there, to be able to see it through and have memory that’s associated with verbal recall or word recall. These are more of the executive functions.

Also, very often, people will experience mood or emotional dysregulation, irritability, thinking through like mud, or feeling like they’re in a haze or a fog, and problems with sleep. Most people would experience insomnia and a dysregulation of the circadian rhythm. Some people will experience hypersomnolence, particularly in the acute concussion phase, because the system needs to go into a quiet mode, convalesce and rest.

The old adage, again, of, “Go home and rest. We hope it gets better,” has merit. Oftentimes, that’s the best that somebody could do, so get into a low stimulation environment. Being away

from electronic stimulation, stressful work, stressful engagements at home, being able to just really bring the energy home or rest the nervous system.

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One of the technologies that I geek out a lot on – and I think is just phenomenal because anybody can do it and there's no downside and there's huge upside – is flotation therapy. Flotation therapy is kind of like the classic going-in experience. Therefore, again, to be able to rest that whole –

JM: Yeah. We'll discuss that in a bit, because you've got a few specific recommendations in your book, which I neglected to mention the title, which is *The Concussion Repair Manual: A Practical Guide to Recovering from Traumatic Brain Injuries*. It's available online. That's the book that you've written that goes into this in far greater detail.

But it's obvious that if you get knocked in the head in some type of sport or you fall down anywhere and you remember that, but many of these injuries you won't remember – Would it be fair to say that a large number, perhaps the majority of these injuries that result in TBI, actually occur in the home? It could be something as simple and stupid as leaving the kitchen cabinet door open. You're underneath and you just go up. That's an immovable object, and you've got a potential TBI.

Why don't you give us – That's clearly an example. There are others that people might resonate with and say, "Gosh. That happened to me. I didn't know that could cause this type of problem."

DE: Yeah. That's a great example. Oftentimes, in that kind of arena, somebody would have a bump on their head. It would be sore. It would heal on its own within 24 to 72 hours, and they would go on their way. Sometimes there's the cumulative effect. If that, for example, happened, it's ideal to be as mindful in that next-week to two-week window of not getting another bonk on your head or a TBI, because then there's a cumulative blow.

Most people, if they just hit their head on the door or cabinet, it's not going to be enough to have a significant neurological sequelae moving forward, but sometimes, it is. Oftentimes, the thing that happens in the home that will have negative long-term impacts is a fall. If somebody slips on a rug, slips going down the stairs, there's a significant momentum that jostles that brain inside the skull to what's called a coup contrecoup injury, or back-and-forth kind of injury. That's going to be noticeable. The same kind of rules apply on how to treat it.

When people have an experience at home that might feel mild or insignificant, it's important to recognize over the next one to two weeks, is there anything that changes with mood, concentration, focus, ability to be easy in the space. Because oftentimes after the injury, the nervous system's on hyper alert. It's inflamed. There's an inflammatory cascade that's happening. The inflammatory energetics of that look like psychological and cognitive downstream effects – irritability and not being able to, like, drop into center. If somebody, for example, has a meditation practice or they're able to come into their own center point.

JM: Okay. Good. We'll talk about some of those simple interventions that one can use to address that inflammatory response. Before we get to the treatment recommendations, there are some interesting, novel and new techniques to do assessment as to actually the extent that use infrared imaging. Can you discuss those?

DE: Yeah. There are some great tests that are used, for example, on the sideline, with iPads, questionnaires, infrared tools to be able to use on the skull to see if there's an active or an acute bleed. The ability to be able to do that lies in vivo, right in the midst of it. For example, concussion right now is the biggest name in sports.

If you're ever watching football and they have to go into the tent, they have neurodiagnostics, as well as a neurologic exam that the practitioner or the physician will provide, to be able to see, "Okay. Is this something that needs to be immediately addressed and therefore no more return to play? Or does it need to be watched for a little bit of time, for another five, 10 or 15 minutes, or is it clear and a person can go in straight away?"

We've seen variable efficacy of that in the National Football League (NFL) just this last year. Those protocols are getting more specific and refined all the time. But suffice it to say, it's important, as soon as somebody has a significant injury, to be able to get evaluated, whether it's by a professional on the sideline, in the emergency department or somebody who's trained in concussion care management, to be able to assess what their level of safety is, and what their level of potential risk should they have another impact.

Just to come back real quick to what you said in the home, I'm reminded too that many of our listeners are going to be adults. They're going to be able to kind of self-reflect and understand how they're feeling inside, but many of these injuries happen with kids. We also need to be really aware of how to be able to assess neurologic system and be able to self-observe if there's any change in their behavior. Because kids are rambunctious, moving around and running around, if there is a significant injury and there's a change in function within the next few days to few weeks, then that means a further workup and more assessment.

JM: Okay. Great. Before we get into the intervention, there are some risk factors that people can have or may know that they're at risk, because a lot of people are doing the 23andMe genetic testing. One of the things that that test allows you to do – Well, it doesn't tell you offhand. You have to run it through a secondary external database to figure it out, like Prometheus, but it's only a few extra dollars – is to find out your ApoE4 allele assessment, which is, of course, a risk factor for Alzheimer's disease. If you have one or two alleles, you're at increased risk.

Interestingly, I interviewed Dr. Dale Bredeisen. He's probably, in my view, the world's leading expert in Alzheimer's. He brought the interesting assessment or conclusion that historically, thousands of years ago, almost every human was double-ApoE4. It was actually just the normal. The variant now with ApoE3 are the abnormal ones.

But if you have it now, it really means that you need to fast. If you don't fast, you're going to have metabolic consequences, which is one of the interventions that we'll talk about in a bit. Why don't you discuss your perspective on the ApoE4? Because I think it's something that

before you get to treatment, if you happen to know your status, you can know your increased risk for this.

DE: Yeah. That's a good point you're raising. What's the interface between concussion and traumatic brain injury and Alzheimer's disease? We know that people who have traumatic brain injuries have an increased risk downstream.

This new nomenclature of CTE, chronic traumatic encephalopathy, low-grade accumulation of concussions over time, has an advanced Alzheimer's-like picture. We're seeing a lot of pro-athletes have Alzheimer's-like brains in their 30s and 40s. There have even been studies that show that collegiate football athletes, who have significant known history of concussions, start to show those changes themselves. It's this acceleration of the process.

If somebody has a positive ApoE4 allele, particularly if they're homozygous, or they have both copies, and they have traumatic brain injury concussion on top of that, it accelerates their risk of Alzheimer's by at least tenfold. It might even be more than that. And then if you look at dietary issues and chronic inflammatory issues, for example high sugar diet, not fasting and these sorts of things, and then you start to stack on lifestyle mismanagement or not being optimized for brain performance, then you're going to accelerate that process even further.

JM: As someone who's personally experienced TBI and really spent the last two decades focusing on this and trying to find tools to help remediate it – Many of our audience are parents and they have children. Many of them are participating in sports. I'm wondering if you've developed any strong feelings about children participating in potentially concussive types of injuries, like football or even soccer and basketball. Football probably would be the major one. I mean, do you feel pretty strongly about that? Are there are precautions you'd recommend, or you just advice not to participate in it?

DE: Yeah. It's a great question. Oftentimes, it's a family-kind of decision. My experience was playing 20 years of soccer and then doing a variety of other sports. I know that there's more and more press and appreciation for the chronic subclinical head injuries that happen on the soccer field. For example, boxers in a ring who get slugged in the face. That's about 20 pounds of pressure to their brain. Soccer players, if you go in for a full volley or a full header, 70 pounds of pressure to the brain.

JM: Wow.

[-----20:00-----]

DE: Right. We just didn't know that way back then. My spec scan showed this hypofrontality in the front because of that chronic frontal impact.

JM: Does it hurt when you do that?

DE: It depends on the velocity of the ball.

JM: Wow. It never occurred to me that was an issue, but wow. It makes perfect sense once you bring it up.

DE: Right. What they're doing now is they're starting to outlaw or make it illegal for kids to head the soccer ball in soccer. That allows kids to continue to play the sport, but allows the management aspect of the sport to decrease the risk of head injury. It's not so much that way in football. Although I do know some municipalities and communities that are starting to move more and more towards flag football up until high school. Of course, it's hard to transition if you've got an athlete who's really on that track start to transition from flag football to contact with helmets and tackling at the college level. You've got to kind of build up to that. I get the concern.

I think there are tackling styles – For example, rugby is the full-tackle sport, and yet there's less of an incidence of TBI in rugby than there is in football.

JM: And they don't wear helmets.

DE: Why is that? They don't even wear helmets. Right.

JM: Yeah.

DE: The reason being is because they have a tackling style that's not led by their head, because their [tackling style] is different. Certainly, there is TBI and concussion in rugby, but there tends to be a lower incidence. There's a stylistic component to that. I think there's a lot of education that is happening more and more now, as should be.

If parents are concerned, and yet they want to continue to opt their kids into sports, then I would have a really clear conversation with the coach about what their stylistic educational tackling profiles look like. Are they asking them to lead with their head? Are they bringing this stuff up? Is there a clear discussion about the importance of brain health and the necessity for recuperation after a concussion? Do the players themselves know what the long-term potential downstream effects are? All of those things.

That's the educational piece just around the sports, and then the educational piece around the lifestyle management, the dietary management and the potential targeted supplementation management. Because we can bring in supplements that help guard the brain against trauma and inflammatory cascades, and the repeated sequelae should another injury get stacked on it. That's why I wanted to put just as much information in the book that I think was usable, so that we can have these kinds of above board discussions.

JM: Sure.

DE: I've heard numbers around, like 25 percent of parents are opting their kids out of contact sports, including football, because of the education and advocacy that's coming out now.

JM: That's good. I'm sure a large part of it is through leaders like yourself. Let's discuss some of the preventive strategies that you discuss in your book, which is – I would mention the major one would be the omega-3 fatty acids, especially animal-based docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). And then we can go to some of the other things, like turmeric and curcumin, and some of your other good ones. Why don't we start there?

DE: Sure. Yeah. It's interesting that many of the technologies, the repair orientation therapeutics, the supplementation strategies, are good for optimizing brain function if you're already good, so going from good to great. They're also good for repairing neurologic function if you're already injured. There's a lot of overlap there. Your point then about bringing up preventative measures, and not just like recuperative and therapeutic measures after an injury, is similar.

Fish oil is one of those great modalities to utilize. There's even more and more appreciation now about the benefits of fish oil at the higher doses, and more appreciation about less risk at the higher doses. For example, 20 years ago when I was in medical school, the rule of thumb was to stay off of fish oil before surgery. That's even changing now.

The Department of Surgery at OHSU – This came from Mike Lewis, who's kind of an expert in the field of fish oil as it relates to concussion recovery. The surgical department at OHSU, Oregon Health and Science University, is even advocating fish oil pre-surgery, because outcomes are better. There's a whole shift in the science.

Of course it's also known that like two-thirds of all the Nobel Prizes for Scientific Discovery were shown later to be false, or something like that. The field is always changing. Science is always evolving, and so is concussion care. After a concussion, the dose range may therapeutically get up to 10 to 14 grams, as opposed to the preventive, which is like 40 to 60 grams.

JM: That's the combination of the EPA and DHA both together, right?

DE: The combination of both. Yeah. In a 1:1 ratio, as much as possible, of EPA to DHA. Usually the DHA is 3:1 to 6:1 EPA. You get much more mood regulation and neurologic support in a close 1:1 ratio. There are consistent benefits downstream, besides just the neurologic support, cardiovascular support, digestive support, immune system support, etc. Fish oil is kind of like top of the chain.

JM: Yeah.

DE: As far as I'm concerned. And then for reparative –

JM: Before we go on there, fish oil is certainly useful. There's no question, especially since you can use it in concentrated forms so easily, but maybe not necessarily the ideal form for a wide variety of reasons. Usually it's not a triglyceride form. It's not absorbed as well. You tend to get belching. A lot of it is contaminated or processed in a way that oxidizes these very perishable

fats. Theoretically, it's good. But, you know, you've got to pay really careful attention to the quality.

DE: Right.

JM: I'd probably recommend balancing it with some natural foods, like small fish, like sardines or other seafood that are high sources. It's going to be really, really difficult to get those levels of DHA and EPA from food, but you could provide some of it at least.

DE: Yeah. I think your point's a really good one, which is that fats are sensitive and volatile. If we're working with therapeutic supplementation, I typically recommend people be as scrupulous as they can be where and how they source it. Don't skimp on it and buy it in big bulky bins that have probably been stored in high temperatures in warehouses for who knows how long. Yeah. Your point there is a really good one. We want to get our source from food, then the body's going to utilize it, absorb it and assimilate it. It's going to be that much more therapeutic.

JM: That is a magnificent tool. I mean it is so profoundly effective. In fact, the pharmaceutical companies aren't stupid. They've actually, I guess, patented it or formulated it in a way that it's a prescription. They can charge like 1,000 dollars a month for it. It's used very effectively in pharmacological doses.

DE: Yeah.

JM: Alright.

DE: I didn't know that it was in a prescription or a pharmaceutical form.

JM: Oh, yes. There are a few companies out there that do that. It's sort of a hidden subsidy. If your insurance company pays for it and you're not paying for it -- But ultimately, we all pay for it because it's 1,000 dollars a month. Someone's got to pay the bill. The insurance company ultimately winds up getting it back through an increased premium. They're not going to lose money on the transaction on the long-term. They can't.

DE: Right.

JM: One of the other interventions that you recommended early on was this flotation tank. I'm sure most of us -- or the isolation tank -- have heard of them. But in your book you discuss actually ones that you could use at home, that are obviously a lot more convenient to use, probably even more cost-effective in the long run. I think it was the Zen Float Company, which you can get for under 2,000 dollars. Why don't you discuss that approach?

DE: Yeah. I think flotation therapy is on the frontline of many different recovery and regenerative medicine protocols, because it has the opportunity to reset so many different systems. Again, we're looking at cost analysis, risk-benefit analysis. It's extraordinarily high in the benefit range. There's essentially no-risk. Anybody can float. It doesn't matter how old you

are, how sick you are, if you're on medications or if you're not on medications. Therefore, it's a stackable therapy.

When somebody drops into a float tank experience or a sensory deprivation experience, it's essentially the first time since they were conceived that they're without environmental stimuli. There's no gravity, because there's flotation, right?

[-----30:00-----]

If people don't know what a float tank is, it's like you're floating in about a foot of water. It's about the size of a king-size bed. There's about 1,000 to 1,200 pounds of Epsom salts. It's very buoyant, kind of like the dead sea. There's no gravity. There's no appropriate reception. There's no skin temperature differentiation, because the water is the same temperature as the skin, not core temperature. It's hard to tell where I end and the rest of the universe begins. There's no sight and there's no sound.

Everything is offline, so to speak. Eighty percent of what the brain is consistently bringing in is environmental stimuli. Now, there's more energy towards the recuperative mechanisms. It's both a brain technology and also a consciousness technology. Because being able to go into the experience of a flotation tank is like meditation on steroids. If somebody's going through the use of it as recuperative and regenerative, I also let them know they may very well likely find more peace in their lives outside of the tank, just like taking your yoga off the mat or your meditation off the cushion, because it starts to reset the neuroendocrine system.

Cortisol levels normalize. Global inflammatory markers normalize. Blood pressure normalizes. The relationship between the brain and the endocrine or the hormonal systems starts to optimize in ways that we didn't – It wasn't really associated or expected that there was going to be all these physiologic benefits.

When the float tank was originally designed by John Lilly in the '60s or '70s, he was using it as a consciousness tool. And then there was a movie called "Altered States." There was the human immunodeficiency virus (HIV) scare. People didn't want to be in a pool of water, where somebody else might have soaked. It kind of went underground in the '80s or '90s. Now, it's going back through a resurgence. [Inaudible 32:02]

If you stack a series of floats, try and do eight to 10 floats in a three- to four-week period. Get as many under your belt as you can. You'll start to notice benefits in whatever your symptoms were and outside. People's moods start to improve. They just start to find that little sense of ease and flow in their lives. After that, you can move into a maintenance routine, which is usually like one or two floats a month.

JM: Yeah. Address the concern for the hygiene. I believe a lot of the newer ones use ozone to disinfect it. That's pretty safe. It has virtually no downside effects.

DE: Super safe. Right. Many of the filtration systems – You're already in salt.

JM: Yeah.

DE: Salt is going to be an antimicrobial medium. And then the filtration systems are UV, ozone or hydrogen peroxide. There's been a big shift going from ozone to hydrogen peroxide lately. All of those are effective. It's a good point, because the industry has continued to keep pace with the potential concerns.

[One] of those other concerns would be claustrophobia. That's like the biggest concern. If it's not hygiene, it's like, "Oh, I don't like to be in closed spaces." There's an easy way to do that. With the lids propped up, you have people drop in. Keep the lid open, stay in that kind of configuration as long as you want. When you feel good, pop the lid down. If you get anxious at all, you can pop the lid back up. That's about it. It's super simple, easy, sophisticated technology that continues to orient us towards the healing potential that resides within all of us.

JM: Yes, indeed.

DE: And an opportunity to rest our minds and get back into contact with that.

JM: Yeah. One of the other benefits that I don't really see people mention but it's obvious, is that the salt you're using is magnesium sulfate or Epsom salts – 1,000 or 2,000 pounds of it. There's a lot of it in there. Soaking in that for an hour will unquestionably help improve your magnesium stores.

Almost everyone watching this is deficient in magnesium. I think it's kind of like vitamin D, which I helped popularize the awareness and consciousness of 17 or 18 years ago. The therapeutic levels were like 400 units a day. Now we know it should be several thousands. Similarly, the therapeutic recommendation, or the recommended dietary allowance (RDA), is like 400 milligrams of elemental magnesium, but probably it should be close to 1,000 to 2,000 milligrams. You're going to get some of that for free as a side effect.

DE: Agreed.

JM: It's a really great idea. And then the Zen Float Company seems like it's been around for a few years. They can sell these tanks for home use for like 2,000 dollars.

DE: Yeah. And there are home kits and blueprints for their home kits. They started as a Kickstarter fundraiser campaign several years ago. It has become more and more popular because people wanted to have kits and tanks at home. They wanted to be able to do it on their own at a much more cost-effective price point. They have gotten more and more sophisticated through that. There are other companies online that do that as well.

Because ideally, this is a home-based practice. This is something that we're able to access and do on a regular basis. Because that market is also opening, many of the float centers themselves are starting to offer groupings and package deals where people can come in and develop not just a float experience, but a float practice.

JM: Good. Another intervention that can be used is hyperbaric oxygen. Similarly, there are alternatives to that, because most people aren't going to buy a hyperbaric oxygen chamber for their house. Although they are available, they're not quite as good as the clinical ones. But you could do something like live O₂, which is an oxygen concentrator that you use with exercise. They can provide pretty similar results. Why don't you first discuss the benefits of hyperbaric oxygen and maybe transition to the live O₂, which is available for home use? It's a little more expensive than the flotation tanks, but it still provides a lot of benefit.

DE: Yeah. Hyperbaric oxygen is getting more and more pressed for benefit of acute TBI and chronic TBI, as well as even chronic stroke recovery. There's a new study that's coming out or maybe just released – I think it's coming out this month – about the benefit of stroke recovery in six months after a stroke.

Being in a hyperbaric oxygen chamber is essentially like you're in a capsule about the size of a single bed. Some of the old chambers look like these diving bells. They're kind of old and clunky. I personally like those too, because they're held and they feel like you're in a bit of a womb experience. Some of the newer ones are acrylic-based. You can see out and they're perfectly clear, so there's not quite the sense that somebody can get with claustrophobia.

You're in this capsule and it's a pressurized tube with pressurized oxygen. The oxygen, what ends up happening is it gets saturated into the tissue, as opposed to just being delivered to the bloodstream. In the midst of being saturated into the tissue, it goes into all of the neuro-reparative mechanisms in the entire neurologic system from head to toe.

We have been using and studying hyperbaric oxygen mostly over the last few decades for wound recovery. With pressurized oxygen, it essentially accelerates all the wound repair, whether it's in peripheral vasculature or in central vasculature, around the nervous system, brain and spinal cord. It's interesting too that one of the earliest indications that we were using hyperbaric was for diabetic wounds, Alzheimer's disease and some of the problems with neurodegeneration as considered in Type 3 diabetes.

JM: Maybe you can comment on the live O₂. Are you familiar with it as an alternative?

DE: Live O₂. What I heard you say was you're essentially using oxygen and oxygen concentrate, and yet you're still breathing it in, right?

JM: Yeah. While you're exercising. If you're not familiar with it, that's fine. It's just a less expensive and easier alternative to hyperbaric.

DE: Is that the EWOT acronym?

JM: Yes.

DE: Exercising with Oxygen Therapy. Yes. From what I've heard from my hyperbaric oxygen therapy (HBOT) colleagues, it's not as effective as HBOT for neurological recovery, because you're not saturating the tissues.

JM: Interesting.

DE: Because you're not driving oxygen into the tissues themselves. Now, you can still get a lot of benefit by hyperoxygenating a system if you have a low PO₂, particularly if you're altitude. EWOT is amazing at altitude, because a lot of people are walking around with PO₂ at like 90 to 93 percent. If you get it up to 97, 98 or 99 percent, you're going to feel a lot better. That's for sure. But I don't think it has the same cross lateral benefit between HBOT and EWOT.

JM: Thank you for that feedback. Let's progress to some of the other therapies. There's a large number of them. I'm not sure that we're going to get to the majority of them. But you're talking about LLLT, which is Low-Light Laser Therapy. It was more recently redefined as PBM, photobiomodulation. Typically, they're with lasers, but nowadays, it's done with light-emitting diodes (LEDs).

[-----40:00-----]

DE: Yeah. If we're talking again about the five kinds of primary building blocks of life: light, water, oxygen, nutrition and pulse electromagnetic fields. We're talking about light and light being in that low-level laser therapy, in the LED therapy, or in the ultraviolet (UV) spectrum therapy. There are a lot of different studies that show light's beneficial.

When we're talking about neurologic recovery or building adenosine triphosphate (ATP) production, driving mitochondrial function, there are certain wavelengths that seem to be optimal for that. Most of the wavelengths for neurologic recovery are going to be in the near-infrared, far-infrared spectrum. Near-infrared spectrum being like 810 to 830 nanometers. That's a lot where the data is coming from. This data is decades old. A lot of the earlier LLLT data came from Russian studies in the early '80s and even earlier than that. There are some handheld devices that can be used.

JM: What's particularly interesting too is there is some benefit in the red light. It can be 660.

DE: For the LED, right. A lot of the technologies too will combine the two. You've got these diodes, where if you're using a pad or a band or something specific and localized, you'll see the diodes, where some won't look turned on and some will look red. The ones that don't turn on are essentially in that near-infrared spectrum. But then you have a bunch of benefit in driving that mitochondrial function – you're right – in the red spectrum.

Being able to combine these therapies, you're getting a couple of different complementary wavelengths to support the process. A lot of the data is showing too that when you localize the therapy in the particular area of the injury, then we're up-leveling function. If we know there's a particular area of the brain that's compromised, if we're doing a functional neurologic exam and we can tell which part of the brain is off, then we can localize that therapy to a parietal system or a frontal system or occipital, wherever it might be, as well as using reparative neurologic, functional techniques.

The most sophisticated kind of orientation that I've seen to identify where the brain is off and therefore where to target therapeutics is functional neurology, much of which has been kind of honed in by chiropractic physicians, which seems to be really good at kind of dissecting that neurologic exam and getting it as specific and localized as possible.

JM: Interesting. You also mentioned pulsed electromagnetic field therapy (PEMF), and that's actually one of my new passions. I continue to be a big fan of PBM, photobiomodulation. But I'm thinking PEMF might even be a more profoundly effective therapy. I'm wondering if you could expand on that and specifically address the types of devices that are being used to provide the therapy.

DE: It's fascinating too when we start to look at the different technologies that are stackable on one another. For example, if we're looking at those basic building blocks of life, then light, water and frequency technologies, all of these are driving similar processes. If they're doing that in a complementary way, then are there ways, devices and methodologies where we can stack these therapeutics in order to get an exponential effect?

If we're optimizing voltage and frequency into the cell, then there are going to be energy thresholds below which disease happens, and above which optimized function happens. Pulse electromagnetic field tends to raise the voltage and the energy in the cell, in the system globally, to improve physiologic function. There are different styles. There's a lot of different – Just like neurofeedback has a lot of different modalities, machines and targeted protocols. PEMF is really similar as well.

Some people will say the low voltage stimulation that is more like the sine sort of waveform of the cell's energy matrix is ideal. Some will say stronger energy into the system is better, so that it can hold the charge for longer. I haven't ever seen any head-to-head studies on whether the low-voltage systems or the high-voltage systems are better. I've seen benefit in each of those. They work quite differently. I've had passionate conversations with a lot of different researchers and physicians about which ones they think are the best ones.

I tend to use a combination of both low-voltage systems and high-voltage systems. There's a low-voltage system called a Bio Electromagnetic Energy Regulation (BEMER). There's a high-voltage system called the Pulse. I found benefits in both. And then if you're looking at that pulsed electromagnetic frequency, there's also a subset of pulsed frequencies called transcranial magnetic stimulation, which is more based in magnetic impulse to the brain. You can do superficial or deep. This is where, again, the science is evolving to see which is better for TBI or concussion that might, again, at that point, be representative of the level of concussion.

For example, if you've got a super strong whiplash injury, or when I got turned upside down in a snowboard park and I cracked the back of my helmet, my brain bounced this way, horizontally, versus when I broke my neck, dove off a pier and hit my crown, it went axil. An axil load would have a different transactional force in the brain than a horizontal.

When you're looking at a spec scanner or a functional magnetic resonance imaging (MRI) scan, then you're getting more specific on being able to see, "Oh okay, is the challenge at more of a

lower cortical level? Is it involving the master glands, hypothalamus, pineal, pituitary? Or is it at a more superficial cortical level involving the executive functions?” That might itself be indicative of what therapy you get, because if it’s deeper, then you need to get into the deeper structures.

That’s another way – if we got into the whole discussion around hormone cascades, one of the challenges that people have with concussions is their hormones go off. Their hormones go off because the master glands are off. When the master glands – the pituitary, hypothalamus and pineal – are off, then they can’t tell the rest of the body what to do.

JM: What’s the precipitating cause for that? Just the brain injury and secondary inflammation?

DE: Right. And the level at which the brain was concussed. That coup contrecoup is really significant. That horizontal or straight axil load will tend to pivot that pituitary, because where it sits on its stalk in the sella turcica, it’s really prone to getting sheered forces and to compromise its function. If the pituitary – like the adrenals, the thyroid and the gonads – [doesn’t know] how to function, then we might be looking at tests that show hypothyroidism, but it’s not a secondary, it’s a primary. It’s coming from the central axis, the master gland itself. At that point, we need deeper structure therapies. We need deeper modalities.

JM: Getting back to PEMF, pulsed electromagnetic fields. Of course, I’ve been teaching a lot about the dangers of electromagnetic fields (EMFs), but this is actually a therapeutic application. Actually, one of the reasons why I’m biased towards these smaller voltage systems than, I think, those higher ones is it could potentially be problematic, but not necessarily. You just have to be careful.

I like to always err on the side of caution. But, you know, we could spend like an hour or two hours talking about that, which we don’t have the time to. I’m actually going to interview William Pawluk. He just wrote a good book about PEMFs (*Power Tools for Health: How Pulsed Magnetic Fields (PEMFs) Help You*). I don’t know if you’ve seen it yet.

DE: Great.

JM: It just came out.

DE: Nope.

JM: One of the other therapies that you discuss in your book is transcranial direct current stimulation, or TDCS, which I’m not a big fan of, because it seems to be more of shotgun and non-specific. It kind of like reminds me of electroshock therapy to the brain. Obviously, it’s a smaller voltage and dose. But I’m wondering if you can comment on your experience with TDCS.

DE: Yeah. Some clients have had incredible experience with it. Many didn’t notice much. That could be because of that global stimulation that’s not as specific as it needs to be. It can be because the frequency is not as high as it needs to be. It could be because their global

inflammatory load is so high that the inflammation needs to be settled before they'll see any potential benefit.

I think if it's going to work, it works early. If it doesn't work, then we leave it and move on to something else. I wanted to put it in there not so much because I've had direct experience with it being beneficial for clients, but a lot of people who I've worked with have said in the past that they've used it and it was helpful.

JM: Interesting. Okay. That's good. I appreciate your comprehensive approach. Now, another valuable tool – I suspect you have one, being a neurologist in this field – would be an EEG.

[-----50:00-----]

It's a powerful, powerful tool. I was tempted to get one, but it's a pretty complex piece of equipment. It requires an enormous amount of training, and really, a commitment of time, effort and energy I just simply don't have. I still may pursue it, but actually, I'll go to a center, because I think there are very valuable components to it. I probably have TBI. I just don't remember it, because that's just in nature, like everyone else.

DE: Right.

JM: But I think there would be great benefit in it. You talk about in your book about Dr. James Hardt and the Biocybernaut Institute, where basically it's a double fulltime job where he's got like 12 hours a day for seven days that you're doing this training. That's just insane. You don't even have the time to eat or sleep.

DE: Right. It was a pretty intensive protocol.

JM: Did you do that protocol?

DE: I did.

JM: Oh my gosh. Why don't you share your experience with it?

DE: Yeah. You're bringing up a great point, which is this last one in neurofeedback. Neurofeedback is one of those things that there's a lot of different tools, there's a lot of different levels of expertise. Some units only have two leads, some have all the leads.

JM: Which is like 18 or 20 leads, right?

DE: Yeah. Actually even further, like 40 to 60 leads. There are some that are full, and some that are basic. Eighteen to 20 is kind of like in the middle, because the caps are easier to put on. It's a little bit easier to use. It is a whole science just by itself.

JM: Sure.

DE: I've seen amazing results with people who know how to do it really well. For example, like Jim Hardt's system. He has the most sophisticated system, I think, probably in the world. He has three different locations. He's super intense with it. You go in to master your ability in real time to see where your brainwave patterns are firing, and then to lock into the necessary thought modalities and internal state to be able to consistently access an alpha state. He also has delta and theta trainings too.

His alpha training has nine levels. His delta training has nine and theta. You can go really deep down that rabbit hole. I've been working kind of on the other side of the spectrum, because I was curious to see what it was like – a very simple system that is only 20 to 30 minutes a day. You're watching a movie and it fades in and out the picture and the sound.

JM: Yeah. I've seen one of those.

DE: Oh, okay. Great.

JM: I forgot the name of it.

DE: I think it's Evoke.

JM: Well, it's a similar technology. It's not that specific one. I have regrets getting that. I think these other techniques – I'm really curious. I mean, you put in a week of 12 hours a day and how you would rate that intervention compared to all the other modalities you discussed in your book. Do you think that was one of the most effective? What's your perspective?

DE: I do, because I think it's so helpful to be able to increase our own capacity to lock into the chosen neuro-frameworks that we desire. If these neuro-frameworks are based around just pure neurologic function, like alpha states, great. Because we know when we're in alpha state, we're more centered and present. We're more effective in what we do. We're not as hyperactive, like taking too much coffee. If I can access that and find that place within myself, then I'm starting to generate my own sense of personal empowerment. Same thing with flotation therapy.

JM: Does Dr. Hardt do a diagnostic assessment to figure out which state you need to work on? Because I'm sure most of his clients aren't coming in and saying, "I need to upregulate my delta."

DE: Right. Yeah. At first, you would need to know like what the benefits of upregulating your delta are.

JM: Yeah.

DE: He does an assessment before and after. Most people have already opted into what they want to work on on their own. [inaudible 54:17] What are your symptoms? What are you desiring to accomplish? What have you tried in the past? What does your brainwave pattern look like now? What do we see with most of our clients who've gone through this, who need how

many treatments over how long a period of time and for how long in each treatment? Ideally, it's individualized to the client's direct symptoms and their goals as possible.

Neurofeedback is one of those things – Again, consistently. Just like any healing art, consistently, when in the hands of somebody who knows what they're doing really well, it's like a race car. You give a race car to a teenager, he's going to kind of bonk around. If you give it to Andretti, it's going to be like art in motion.

JM: Yeah.

DE: I typically recommend that my clients, first of all, treat working with a new provider like dating. It doesn't mean that you have to marry that person. See what their experiences are. See if they have any benefit in working with you to get you from point A to point B as efficiently and effectively as possible.

JM: Great. We're nearing the end of our time together. I wanted to go over two more points though. One is the use of CBD, cannabidiol, as a treatment modality, which is becoming progressively legal in more states now. Maybe you can discuss that, and then briefly we can close on a really great section of the book that you have at the end, which is the 10 rules of engagement, which is a pretty extensive interaction guide.

DE: Yeah. With CBD, it's up there with fish oil, as far as I'm concerned, for neuro-reparative support. It's been interesting that the Drug Enforcement Administration (DEA) or The National Institute of Mental Health (NIMH) under the DEA has had two medical patents for marijuana for close to over 20 years, and yet it's still been Schedule 1, which is hypocrisy just by itself, because Schedule 1 means benefit and it's highly addictive. Well, obviously, there's medical benefit, otherwise you wouldn't have the medical patents.

We know that there is a therapeutic experience that people have with cannabis. Cannabis has two primary components that we're talking about when we're talking about therapeutics – one is tetrahydrocannabinol (THC), and one is CBD. THC has a psychoactive component. CBD has a neuro-reparative component. There seems to be an upregulation effect or an enhanced effect if there's a little bit of THC with CBD. The CBD to THC ratio will be like 20:1.

JM: I've seen studies even 10:1.

DE: Yeah. You can go down to 1:1.

JM: Yeah. But you don't need a lot of THC. [That's] the point. It's a relatively small amount.

DE: Exactly the point.

JM: Usually sub-psychoactive.

DE: Right. We've seen consistently the benefit in the neurologic system, whether it was stroke recovery, concussion recovery or seizure and epilepsy support. That's kind of like where CBD

came online. Its potential support over this last decade was with kids who had had intractable epilepsy and/or getting benefit on pharmaceuticals. When they were either stacked on with CBD or transitioned off with just using CBD as a primary, their epilepsy got better. There seems to be this kind of like neurologic repair effect.

The CBD receptors are globally affiliated with neurologic function throughout the entire brain. When we're engaging and stimulating those receptors, then we're seeing the neurochemical cascade towards repair, regardless of the input, but particularly with concussion. That's why during the acute phase, if somebody has an injury that is significant, I say, first and foremost, do a couple of things. Lifestyle management. Get quiet. Float if you can. Take fish oil, take CBD, even vitamin D. Melatonin, particularly if there are issues with sleep. Anti-inflammatory – boost the antioxidants. But CBD and fish oil kind of go head-to-head right there.

JM: CBD may actually be a really potent stimulator of the nuclear factor-like 2 (NRF2) pathway, which is the way a lot of these vegetables and herbs work. They basically stimulate these hermetic productions of antioxidants. If you're not taking too many, it really sort of selectively figures out how much your body needs. CBD is very effective for stimulating that pathway. I didn't realize it until recently. Why don't you discuss the top 10 rules of engagement from your book?

DE: Great. Do you want me to just run through those?

JM: Yeah. Briefly. If you haven't figured out by now that this is – If you have TBI or you know someone who does, this *Concussion Repair Manual* – Don't wait. Just get this book because you need it. There's a lot more details in this book than we had the time to discuss. It's an amazing resource that compiles most of them in one place, so that you don't have to go out and do the homework yourself. Dan's already spent 20 years doing it for you.

DE: Yeah. What I wanted to do in the book is I essentially wanted to write it as a fairly available user's manual for the person going through the experience themselves. There are a lot of different methodologies, kind of like a buffet of options.

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The encouragement is to get clear on what are the available tools in somebody's immediate environment that are accessible, that they can try on, and then stay consistent with that methodology while tracking their symptom over a 30-day period. And then while staying with that, if there was improvement, great, then continue to move on.

If there was improvement but you think there could be more improvement, then you may need to up the intensity or the frequency. The intensity might be – We didn't even talk about ketogenic diet, which I know you know a lot about in regards to *Fat for Fuel*. It might be going even more keto, going even lower carb, or doing that in a more kind of like intense way that is stacked on with flotation and low-level laser therapy. Find a hyperbaric oxygen tank that somebody can dive and do that regularly.

Pick the top two or three methods that you want to try on. Stay with that over a period of time, be diligent, get support and accountability, and make sure that you're tracking your top symptoms

from the concussion or the neurologic injury, if that's sleep, irritability, focus, concentration, etc. I put a part in the book that's a work book, so that it's easy to kind of track it on a daily basis. That's the tracking and the accountability part of it.

Even more important than that, I think, is staying diligent and knowing deeply that everything is possible to heal. Everything's been healed. The brain is super plastic. We know that being consistently engaged in optimized modes of thinking, optimized modes of inspiration and empowerment, affect people's healing. It's as much of a mindset thing as it is a neuroanatomy and a neurochemical thing.

When we bring it back into our own selves around personal empowerment, optimization and faith – Faith is one of those things like, “I know I can get better. I know this can get better. I might need some support in this regard [inaudible 1:02:16], the support that I need. I'm not going to settle for feeling compromised for the rest of my life.”

JM: Great. Well, congratulations on putting together such a magnificent resource that almost everyone viewing this would benefit from. Just have it in your library as a resource, because if you haven't had a TBI, you're really the rare individual. But there's no doubt in my mind that you know someone who does. There's a strong likelihood if you haven't had a TBI yet, you will get one in the future. It's better to be prepared and have the knowledge before you need it.

The Concussion Repair Manual: A Practical Guide to Recovering from Traumatic Brain Injuries is the book to get. I really appreciate all the work and effort that you put into it. Getting a book is one of the best investments you can make. For 15 to 20 dollars, you get like 20 years of someone's hard work. Writing a book is not easy. I've done a number of them, so I know what you go through to put it together.

DE: Yeah. It's been a pleasure to be on the show with you, Dr. Mercola.

[END]