



Episode 288: Breakthrough Solutions for Anxiety,  
Depression, and PTSD With Apollo Founder Dr.  
David Rabin

Child: Welcome to my Mommy's podcast.

This episode is brought to you by Four Sigmatic, creator of all things superfood mushrooms and founded by my favorite Finnish Fun guys. I love all of their products, and in fact, I'm sipping their Reishi hot cocoa as I record this. These superfood mushrooms are always a part of my daily routine with their coffee + lions mane or coffee + cordyceps in the morning for energy and focus without as much caffeine as coffee to their chaga and cordyceps in the afternoon for antioxidants and immunity and the Reishi elixir at night for improved sleep. They also just released skin care that so clean you not only can eat it.... But its encouraged. Their charcoal mask has activated charcoal to clarify, chaga and cacao for an antioxidant boost and other herbal and superfood ingredients. It's so clean that it can literally be made into a cup of hot cocoa as well! Their superfood serum contains a blend of avocado and olive oils with Reishi and herbs for a hydrating skin boost. As a listener of this podcast, you can save 15% with the code wellnessmama at [foursigmatic.com/wellnessmama](https://foursigmatic.com/wellnessmama).

This episode is sponsored by Just Thrive Health probiotics. I found this company when searching for the most research backed and effective probiotic available and I was blown away at the difference in their products! They offer two cornerstone products that are both clinically studied and highly effective. The first is their probiotic, which has been clinically studied to help with leaky gut and to survive up to 1,000 times as much as other probiotics or the beneficial organisms in something like Greek yogurt for instance. The difference is, their spore-based strains work completely differently than other types of probiotics. Also, this probiotic is vegan, dairy free, histamine free, non-GMO, and is made WITHOUT Soy, dairy, sugar, salt, corn, tree nuts or gluten—so it's safe for practically everyone...I even sprinkle it in my kids food and bake it in to products since it can survive at up to 400 degrees! Their probiotic contains a patented strain called Bacillus Indicus HU36®, which produces antioxidants in the digestive system – where they can be easily absorbed by body. Their other product is a K2-7, and this nutrient—you may have heard of it—is known as the “Activator X,” the super-nutrient that Weston A. Price—a dentist known primarily for his theories on the relationship between nutrition, good health, bone development and oral health. He found this prevalent in foods in the healthiest communities in the world. Their K2 is the only pharmaceutical grade, all-natural supplement with published safety studies. Like the probiotic, this is also, gluten, dairy, soy, nut and GMO free. Both are best taken with food so I keep both on the table. My dad has trouble remembering to take supplements so he taped them to the pepper shaker, which he uses daily, and they're now on his daily list as well. Check them out at [justthrivehealth.com/wellnessmama](https://justthrivehealth.com/wellnessmama) and use the code wellnessmama15 to save 15%!

Katie: Hello and welcome to the "Wellness Mama Podcast." I'm Katie from wellnessmama.com and I really hope that you will listen to this episode with an open mind and stick with me all the way through, because I am talking to one of the smartest people I've ever met about some really important topics including really scientifically tested breakthrough ways that they are managing, treating, and actually fixing things like anxiety, treatment-resistant depression, PTSD, and so much more. And there are some great tips about things like even just improving your own sleep, your children's sleep, and your heart rate variability, which is one of the things most linked to health.

And I'm here with Dr. David Rabin, who is the chief innovation officer, co-founder and co-inventor at Apollo Neuroscience. In his role, he's developing Apollo Neuroscience's IP portfolio and running clinical trials of the Apollo technology, the first wearable system to improve focus, sleep, and access to meditative states by delivering gentle layered vibrations to the skin. We're going to get into that today. Dr. Rabin is a Board Certified psychiatrist, a translational neuroscientist, and inventor and has been studying the impact of chronic stress in humans for more than 10 years.

He has specifically focused his research on the clinical translation of non-invasive therapies that improve mood, focus, sleep, and quality of life in treatment-resistant illnesses. He has 4 patent-pending applications and 40 more recently filed. He received his MD in medicine and PhD in neuroscience from Albany Medical College and trained in psychiatry at Western Psychiatric Institute and Clinic at the University of Pittsburgh Medical Center. Dr. Rabin has also organized the world's largest controlled study of psychedelic medicines in collaboration with colleagues at Yale, the University of Southern California, and MAPS to determine the mechanism of psychedelic-assisted psychotherapy and treatment-resistant mental illness.

It's really fascinating. Make sure to pay attention to that part of the podcast. And we're gonna go deep on what that means and the implications for anyone suffering from those conditions. So buckle your seat belt and listen up. This is one of my favorite interviews to date. Here we go.

Dr. David, welcome and thanks for being here.

Dave: Thank you so much for having me, Katie. I really appreciate it.

Katie: You are undisputedly one of the top experts in the country about this and I'm so excited to go deep. But I'd love to hear first, how did you get into this area of research to begin with?

Dave: That's a great question. It's been a long path. I think the original impetus for me was that as a kid, I had a lot of really vivid dreams. And I would have dreams where they were so real that I wasn't able, when I woke up, to realize what was from my real life and what was from a dream. And that really fascinated me because I was told, as a child, that what happens in dreams are not real and not consistent with real life but I was having these experiences that made me feel like they were actually happening or had happened. And so that made me, from a very early age, really fascinated by consciousness and our sense of, you know, what is reality and what is this experience that we all share together.

And so from there, I started studying...over time, that field has actually turned out to be very difficult to study which is no strange fact to people in that area. And so I ended up pursuing the study of resilience because, and resilience being how well do we adapt to stress in our lives. Because one thing that I noticed over time was that, particularly through my medical training, was that many people have very severe trauma in their lives, physical and mental and emotional, and they overcome that constructively and are able to use the mistakes

that they made or the trauma to learn from and to strengthen themselves as people and become much better and stronger versions of themselves.

And we see that in a lot of the leaders in our community and so I saw that and then I also saw the population of people, which was overwhelmingly in the majority, who have had either equivalent...who have had roughly equivalent levels of trauma but have not overcome or have succumbed to the trauma and not recovered effectively and developed, as a result, physical or mental illness. And so I started looking at it on the cellular level with human neural stem cells, looking at aging disorders of blindness and dementia and why some people would develop that compared to others. And then I did that for about six years in New York and then realized that the stress response mechanisms that go on in our neurons are actually very similar to the stress response mechanisms that occur on the whole body level.

And that made me really interested in mental health and helping people cope with stress more constructively on the whole. And so I started, I went into psychiatry and with a focus on post-traumatic stress disorder and treatment-resistant mental illness like anxiety, depression, and substance use disorders and particularly with a focus on why do people self-medicate, for instance. And ultimately found that one of the key factors to helping people get better in these situations is helping them feel safe, whether that's in the office or whether that's at home. Safety is the single biggest factor that helps facilitate recovery and healing.

And so from experiencing that, we ended up developing a technology called, which is the Apollo technology, that uses vibration delivered through a wearable that actually induces feelings of safety in the body in near real time to help people cope with stress and perform under stress more effectively.

Katie: That's so fascinating and I definitely wanna make sure we go deep on the Apollo in a minute. But I love that you mentioned the word resilience and I'm curious, before we move on to I know things that are going to be obviously helpful with that, if there were any patterns or trends or traits that you saw in people in an aggregate that seemed to predict if they were gonna be more resilient or not, or if they were gonna express with mental illness or if it was gonna make them more resilient. Because that's something I think about a lot in, you know, how do I give my kids the tools to be more resilient in life and how can we as individuals become more resilient in life? So were there any patterns that showed up there?

Dave: Yeah, absolutely. I think what's really the most interesting patterns that I've witnessed are, I think, what we call cognitive patterns. So they're patterns about the way that we think about our lives. So on a very basic level, this could be something like the way that we look at challenge or failure. A lot of people in our society, we're taught oftentimes that when we're faced with challenge, especially challenge that we don't understand, we frequently ask the question, why me? Why do I have to go through this? Why do I have to face this? Rather than seeing the challenge or the opportunity to make mistakes as an opportunity for growth that pushes us to be our best selves.

And I think that the most important thing to think about when we talk about challenge is that, you know, if we went through our lives completely unchallenged, then we wouldn't be forced to learn a lot of the critical skills that we need for survival and caring for ourselves. And we see that a lot in multiple different examples in our society. However, when you are forced to overcome challenges and you're forced to reconcile with mistakes which puts you into a position where you feel that learning from these opportunities...these are opportunities for learning that make us better.

That goes back to Nietzsche who said, "What does not kill us, makes us stronger," is actually not related to physical injury but really mental and emotional injury. And this is something that is overwhelmingly true but not necessarily practiced or considered. And I think that leads into a very...a much more important finding about resilience has been discovered in the last 15 years which is called heart rate variability. And heart rate variability is the rate of change of your heartbeat over time. And so typically, when you think of your heartbeat or your pulse, you think of having 60 beats per minute pulse is good at rest and 60 beats per minute, we often think of as one beat every second.

But in reality, what's happening with your heart is sometimes, it's one second between beats, sometimes it's one and a half seconds, or sometimes it's half a second. And the more variability there is between your heartbeats in terms of how much the heart rate is changing over time, the more adaptable to your environment you are. And we now have tons of studies that have come out from the athletic and performance literature and also from the medical literature that show that if you have low heart rate variability, which most commonly is caused by things like lack of sleep, chronic stress, persistent stress, and burnout, and just stress in general, if you have low heart rate variability over time, your chances of developing a physical and mental illness are much higher and your chances of recovering from a physical and mental illness are much lower.

And your chances of developing, say in the hospital, sudden cardiac death as a result of...when you're recovering from a cardiac illness or a procedure is much higher if you have low heart rate variability. And so clearly, heart rate variability has come to the surface as a really useful metric that we can all use because now, you can measure it with wearables to predict and ascertain resilience and how basically adaptable your body is to stress. And so now we're using this a lot and it's starting to become used a lot more in society. And you'll see your Apple Watch measures it, and your WHOOP measures it, an Oura Ring measures it, a number of other devices measure it, but we don't talk a lot about how to improve it.

And there are a lot of natural ways to improve it like meditation, mindfulness, deep breathing, regular yoga practice, good nutrition, biofeedback, and these kinds of things. But those take a lot of time and effort for people to practice but all of those are powerful resilience training tools that have been around for sometimes in the case of deep breathing and meditation thousands of years. But they can also take thousands of hours of practice to become really good at. And so where Apollo and even psychedelics start to come into play is that these are techniques or tools that allow us to dramatically improve our resilience and our adaptability in short order with just a few doses of medicine, or in the case of Apollo, a wearable that you can keep with you all the time, to help train your body to reinforce your adaptability throughout your day.

Katie: Yeah, it's so fascinating. That is one of the few metrics I really track carefully ever since I started reading the literature about it. Just as a benchmark, before we start going into talking about specifics that can help, what do you consider a good range for HRV? And does it vary with age or body type? Are there variables there?

Dave: So HRV is a bit of a complicated metric and I think there's still a lot of understanding that we need to do because, in truth, only in the last five years or so, have we been able to start measuring heart rate variability in people throughout the course of their day and their lives. Until wearables like the Apple Watch and the Oura Ring and Whoop and some of these other things came out, heart rate variability wasn't really a metric that was used very much in the general population or the medical field other than to predict, for example, your risk of sudden cardiac death and it was not using mental health really at all. And so there is still a lot of work that has to be done from understanding how heart rate variability changes over time.

But ultimately, so I guess to answer your question, we don't exactly know what is a good heart rate variability for any one individual because everybody's baseline is different. And so I can tell you that ideally, we wanna have our heart rate variability somewhere between 60 and 120. When I see and work with the most elite performers or people who are expert meditators, their heart rate variability is oftentimes in between 120 and just over 200 milliseconds which is pretty incredible. So ideally, that could be our goal is to aim for something in that range. But ultimately, in general, with people like us who are very busy and active in our lives, having something between 60 and 120 milliseconds is good for most people.

And I think the goal is to just try to aim to trend your heart rate variability upward as much as possible because we don't know what your maximum is. There may not be a maximum for your heart rate variability. And so ultimately, more importantly, then a single measurement is trending it over time and ensuring that you are continuing to practice activities that promote a positive trend in HRV rather than the opposite. And people who are really chronically stressed out will oftentimes have an HRV that's in the 20 to 40s range or even lower. And that correlates with a lot of the decrease in performance and recovery and poor sleep and poor mood regulation and things that we've been talking about.

Katie: That makes complete sense. I know I feel like pretty accomplished as a mom of 6 when I can keep mine over 100 on a daily basis. But I know I've heard from people who it's more like the 30s or 40s and they want some ways to increase that. So that's really helpful to understand. I also have a friend who is very conscious of breathing and meditation and all of that and his is routinely over 200, which I didn't even know it's possible till I met him. So I think you're right. There's so many variables that come into play there. And I want to make sure we have enough time to talk about this. I'm just going to jump into the like semi-controversial big stuff right now.

I mentioned in your bio that you helped organize the world's largest controlled study of psychedelic medicines with Yale, USC, and MAPS to study the mechanism of psychedelic-assisted psychotherapy in treatment-resistant mental illness. And there's a lot I wanna unpack here. Before we move on though, can you explain what MAPS is because people may not be familiar with MAPS?

Dave: Sure. MAPS is the Multidisciplinary Association of Psychedelic Studies that is a nonprofit that was started by Rick Doblin and colleagues in 1985 to basically forward research into psychedelic and really what's called altered state medicine. So these are medicines that change our mindset in over a short period of time, pretty significantly, that facilitate states of healing or the states that promote healing. And so, originally, I think when we look back, it's very easy to forget about the original research that led up to all of this work that MAPS has done.

But ultimately, psychedelics medicines like LSD and MDMA and a lot of the medicines, even psilocybin, which comes from mushrooms, were medicines that were traditionally used to treat trauma, mental and emotional trauma. And even originally in the '50s, '60s, and '70s, this was the chief use of these medicines. Unfortunately, they were not controlled properly and they were released out into the public and became substances of abuse. And so also that led a lot of the political, you know, the politicization of these medicines and unfortunately, the banning of a lot of them in the U.S. which prevented research.

And so MAPS in 1985, particularly with Rick Doblin's brilliance said, "Okay, we know that these medicines are really, really effective and we know that if they're used in the proper safe setting, that they can deliver incredible results therapeutically for mental and physical...mental and emotional illness. And that you can do a pretty good job of providing safe experiences as long as you properly prepare the subject and have a well curated experience with therapists and/or doctors present and then you have the integration sessions where you really take everything you learn from these experiences and integrate them into your life afterwards ideally with the assistance of a therapist who understands what you're going through."

And so MAPS, and Rick Doblin went and basically said, "What is going to be the best way to get these medicines out there? Well, let's use them to help people who have the most severe conditions that are untreatable with any other medicine in the Western medicine, particularly in mental health." And so he started to focus on PTSD and particularly veterans with treatment-resistant PTSD. And fast-forward now to just a few years ago, the five-year review results came back from the FDA phase II study of treatment-resistant PTSD using psychotherapy assistance with MDMA, which is a 12-week protocol with just 3 doses of medicine delivered with 2 therapists in 8-hour sessions.

And most of the 12 weeks is psychotherapy. And what happens is that the results, five years out, showed that over 60% of these folks who are diagnosed with treatment-resistant PTSD, who on average have had PTSD not responsive to any Western medicine for on average 17 years, 5 years after just 3 doses of MDMA and 12 weeks of therapy, are completely...60% are completely symptom-free. And this is a groundbreaking result for psychiatry because it is using medicines and a paradigm that we have not understood medicines to be useful before.

And so typically, in psychiatry, we prescribe, we're taught to prescribe medicines that people take every single day and that you take these medicines every day and ideally, you also go to therapy and over time, you get

better. But what we ultimately see is that unfortunately, people become dependent on the medicines or have significant side effects of medicines that prevent them from taking them. And so what drugs or medicines like MDMA and psilocybin or the other psychedelics come in is that they are inducing rapid long-lasting change in people that with only three doses of medicine that don't require continued daily usage.

And people ultimately who go through these treatments are...what happens is after they experience these medicine sessions and integrate everything they've learned with their therapist, a lot of the work happens on their own because they now feel safe enough and feel motivated enough to embrace change in a positive way in their own lives. And so a lot of the healing ultimately comes from within themselves and MDMA or psilocybin really uses a tool to help open up and remind people that they have capacity, that we have the capacity to self-heal. And so that's what a lot of these studies have been moving towards.

And now MDMA has actually just started its phase III trial with the FDA in just over 200 subjects and we are working with them to...with MAPS to collect saliva samples from all these subjects before and after their treatment so that we can look at the changes to the DNA expression of trauma and reward response and stress and reward response genes that we believe to be contributing to the long-lasting outcomes from these medicines.

Katie: That's amazing and really striking because I know that, you and I talked about this in person, but when it comes to mental health and medication, this is, I mean you said it was groundbreaking, but like truly astonishing compared to things like the traditional treatments for anxiety and depression. Is that right? I mean I know we talked about how that ratio of side effects to actual positive outcome, what that looks like in the treatments that are used now versus what it could look like in psychedelics but can you go a little deeper on that?

Dave: Yeah. So one thing that we are oftentimes not told as physicians by the pharmaceutical companies is that when you really look at the data overwhelmingly of people who are treated by antidepressants or anti-psychotic medicines, for instance, what we look at are two major numbers that are really important or statistics that are really important. One of them is called a number needed to treat, which is how many people do you need to give them medicine or therapy for them to experience positive therapeutic benefit. And the second one is number needed to harm, which is how many medicines or therapies do you need to give to somebody or give to people to start to see side effects pop up.

And unfortunately, with most of the mental, the medicines that we use to treat mental illness, what we're seeing after many, many years of population studies is that the number needed to harm is actually lower than the number needed to treat which means that if you prescribe these medicines to people, on average, if they are...the patients are more likely to experience side effects from the medicine than they are to experience benefit. And I think if most physicians who are prescribing these medicines and most patients knew that this was the case, they would probably be a lot more cautious about the way that they prescribe them and maybe not use them as a first-line therapy.

I think what's really paradigm-shifting about, and just to put it in perspective, psychotherapy, for instance, has a very, very good high...a very low, for the most part, number needed to treat. You don't need to treat a lot of people to start to see positive therapeutic benefit particularly when you can get the patient to practice what they learned in treatment. But it has a very, very, very high number needed to harm because psychotherapy is very safe and it's very difficult to harm people with it. Psychedelic medicines like MDMA and psilocybin, both of which I forgot to mention, received breakthrough status from the FDA, psilocybin for treatment-resistant depression in 2018 and MDMA also for treatment-resistant PTSD, which accelerates their process through the FDA and this accelerates the ability for people to access it in the community.

These medicines have the opposite ratio of these statistics. So with something like MDMA, you can have one dose, and what's really paradigm-shifting with these medicines, you can have one dose of MDMA or psilocybin and have a dramatic self-acceptance, non-judgment, empathetic experience with yourself that's incredibly therapeutic that if done in the right way can last for days, weeks, months, and even years afterwards. And that's just one dose of medicine whereas... And so the risk of side effects is much, much lower than taking medicine every single day. And so it's really paradigm-shifting because mental health has never had medicines like this that we could do research on where we could induce such rapid and significant change with just a single dose or three doses, in the case of the phase III trial with PTSD.

And so now, a lot of what we're struggling with as a field is how to effectively integrate these medicines into our practice and provide safe and effective access to as many people as possible. And that's a challenge that we're going to face nationally as physicians over the next 5 to 10 years after these trials are completed with the FDA.

Katie: Yeah. I think you're totally right on that. And I think that there's still so much misinformation and just like emotional stuff that tends to go along with even just the word psychedelics. And they're often...that word is often tied to like party culture or to using these things in a recreational environment. I think that's why it's so important to educate about the truly therapeutic uses for these because there are so many people, including the listeners of this podcast, who are working through anxiety or depression or PTSD and perhaps have never even considered these kinds of treatments. To go a little deeper, can you explain what MDMA is, like maybe what effect it's having on the body in the brain and also what it means to be in phase III clinical trials?

Dave: That's a great question and I think the language concept that you bring up is really important. And the language with the way that we describe these medicines is that they should be described as medicines, not drugs and not psychedelics. Because ultimately, what they are, they're perceptual medicines. They're medicines that change the way that we perceive ourselves and our environment and our connection to ourselves and to our environment. And so if we talk about them, we change the way we talk about them to be medicine rather than drug, rather than recreational substance, or psychedelic.

It's supposed to change the way that we see these things and the way that we see that we can integrate them into our society effectively and the way we practice health. But going back to MDMA specifically, MDMA was one of the first what's called an empathogen or a medicine that induces a state of radical empathy and self-acceptance. And this was actually discovered in the early 20th century but then kind of shelved at a pharmaceutical company who didn't really understand the purpose of it or what it could be used for. And then it was later rediscovered by Sasha Shogun who actually tried it himself and recognized that there were dramatic benefits to it that were not ever previously perceived.

And so he ended up distributing it to, it was legal at the time, and he distributed it to therapists to use for couples therapy, for people who were unable to see eye-to-eye, and it worked incredibly well, and there's a ton written on this subject which all happened in the '70s and '80s prior to MDMA becoming a recreational substance of abuse. And it was also used for trauma treatment. And the thing about MDMA that's unique is that it pretty selectively activates the emotional cortex of the brain, which is the central component of our brain that's focused on compassion, empathy, gratitude, self-acceptance, radical non-judgment, and interconnectivity or seeing the connections between us and ourselves and everything else around us.

One of the best way to describe the MDMA experience that we like to use for people is what we call child's eyes, which is being able to have an opportunity to go back and see the world again and see yourself again as you did when you were a child before anything bad happened to you or you had seen anything bad happen in your life. And MDMA, interestingly enough, is also not a traditional psychedelic. So it doesn't provide really hallucinations or perceptual disturbances in your environment where you see things or hear things that you don't believe are there. And so it's a very safe and emotionally-connecting and comfortable experience.

But one of the main things that most people say when they experience MDMA for the first time, whether they're in a therapeutic setting or not, is that they experience this feeling of radical safety. And radical safety is critical because that's something that we always strive to provide people in our therapy sessions without drugs. And what radical safety does is safety allows us to see and understand and take action on opportunities for change that we may have not seen or made the steps to forward when we're in a state of fear or threat or perceived fear or threat. Because threat and fear, especially over time, directly inhibit our ability to change.

And so safety is critical for change and we now know this not only from psychotherapy and the history of psychoanalysis but also from these new studies that are coming out about MDMA which really just focuses on providing the subject with feelings of radical safety that dramatically accelerates their ability to change themselves with the help of a therapist or two therapists. And so phase III, why it's so significant that these are in phase III with the FDA is because phase III studies are the final step for a drug or medicine or therapy to reach the public. And so, at this point, MDMA has already gone through phase I trials, which look at toxicity and look at side effects, which were very...they had very good results and side effects were very, very minimal and not significant compared to many of the other medicines that we prescribe.

And phase II is the trial that was completed that I told you about which had the dramatic results in a population of about roughly 100 subjects with treatment-resistant PTSD, where five years out, something like

60% of people were still symptom-free and without any further medicine or therapy. And so phase III is a much larger double-blind, randomized, rigorous, controlled trial, that ultimately is the final step that MDMA has to go through and all medicines, new medicines, have to go through before it can be prescribed by a physician freely in a clinic.

And so this is really exciting for our field because MDMA will likely be, in addition, ketamine already exists legally and can be used for psychedelic-assisted psychotherapy as well for treatment-resistant depression, but MDMA will be the first medicine that was illegal or illegal back in the '60s, '70s and '80s, that will now be ultimately legalized for treatment of severe treatment-resistant PTSD and eventually other mental illnesses as well.

Katie: That's amazing and really exciting. And I definitely resonate with what you said about that feeling of safety. Because having been through an experience that created PTSD for me in the past, that's a profoundly painful thing to feel not safe in your own body. And then to experience what you mentioned about self-acceptance and self-love when you have it for so long, is really dramatic and striking. And it makes total sense to me why people could see really drastic changes in such a short time from these kinds of medicines. You also mentioned that psilocybin received breakthrough status. So walk us through a little bit how psilocybin is different or the same as MDMA and how it's used in a clinical setting?

Dave: So psilocybin and MDMA and actually LSD for that matter and many of the other psychedelic medicines that induce similar effects are and that have been used traditionally for the treatment of trauma were actually found recently to activate a very similar part of the brain, which is really fascinating. And I think this work will be very, very important as we move forward into the next generation of science in this area. And it was work that was done by Franz Wilhelm Water in Switzerland, who found that over the last 10 years of studying these medicines, that they activate very, very similar parts of the brain. And not only very similar, but actually at the same or right near the same receptor site, which is called the 5-HT 2A receptor, which is a serotonin receptor, that is predominantly located in the cerebral cortex of the brain, which is where we store our memories and experiences.

And also not just physical memories and experiences, but also emotional memories and experiences. And so what happens is and what we believe to be happening is that based on the work that that Goldwater's group did is that when you experience meaningful interactions in your life, whether it's drug or substance or medicine related or it's just an experience that comes from having a great time hanging out with your friends in a really positive environment, you're activating the 5-HT 2A receptor, which gives meaning to your experiences. And the meaningfulness of these experiences seems to be a factor of activation of this receptor site in bursts. And the reason that's important is because what the most common side effect of people who take selective serotonin uptake inhibitors for depression or anxiety is that they feel numb.

And part of the reason why people believe that the numbness occurs and numbness unfortunately, usually starting with people not being able to be sexually aroused or have orgasms, which is a very severe and unpleasant side effect of SSRIs and very common, unfortunately, is that it's believed that those medicines

increase the total amount of serotonin around of serotonin receptors like 5-HT 2A but also all the other serotonin receptors. And what happens is that when you flood that receptor, you prevent burst activity from happening anymore. And so first activity comes from having meaningful experiences in your life, again, or using tools that help enhance the access to meaningful experiences.

So that's where MDMA and psilocybin come in and LSD, which directly have been found now to bind the 5-HT 2A receptor and provide this significant or facilitate the significant burst of activity at that receptor site, which now is believed to be the most important source of how people experience these dramatic changes in meaning or incentive meaning towards self and others when they take these medicines. And the reason why we know that now is because the group did this amazing experiment where they gave people an oral drug called cathantharine which blocks activity just at 5-HT 2A. And when they show this, when people take psilocybin mushrooms or psilocybin extract or LSD, that when they take the cantatharine as well, it completely blocks any effect from these psychedelic medicines in terms of shift in meaning.

And so the only way that could happen is if this receptor sites, these 5-HT 2A receptor site was critical to our interpretation and understanding of meaning from our experiences in our life. And so there's still a lot of work obviously that has to be done in this area to flush out exactly what's going on with these medicines and how they work. But, ultimately, the meaningfulness of all of this is that we have the capacity to change how we interpret meaning from our lives on a regular basis. And this can be with things like human touch, calming soothing music, deep breathing meditative mindfulness, or psychedelic medicines, or things like Apollo wearable. And that technology and all of these different things are tools that can be used in very specific ways to help us feel safe by enhancing positive meaning in our lives.

And so that seems to be the way that most of the things are working. And they all have slightly different ways that they work. But ultimately, that seems to be the way that they all kind of converge is on helping us be more present by being safe and accepting of ourselves so that we can change the way that we see ourselves or change the way that we see the meaning that comes from within ourselves and from everything else around us in our lives.

Katie: That's probably the best explanation I've ever heard. And I love that you went into actually was happening biologically in our body because I think that, for me, at least understanding that really helps me to understand the true benefit of things like this.

This episode is brought to you by Four Sigmatic, creator of all things superfood mushrooms and founded by my favorite Finnish Fun guys. I love all of their products, and in fact, I'm sipping their Reishi hot cocoa as I record this. These superfood mushrooms are always a part of my daily routine with their coffee + lions mane or coffee + cordyceps in the morning for energy and focus without as much caffeine as coffee to their chaga and cordyceps in the afternoon for antioxidants and immunity and the Reishi elixir at night for improved sleep. They also just released skin care that so clean you not only can eat it... But its encouraged. Their charcoal mask has activated charcoal to clarify, chaga and cacao for an antioxidant boost and other herbal and superfood ingredients. It's so clean that it can literally be made into a cup of hot cocoa as well! Their

superfood serum contains a blend of avocado and olive oils with Reishi and herbs for a hydrating skin boost. As a listener of this podcast, you can save 15% with the code wellnessmama at [foursigmatic.com/wellnessmama](https://foursigmatic.com/wellnessmama).

This episode is sponsored by Just Thrive Health probiotics. I found this company when searching for the most research backed and effective probiotic available and I was blown away at the difference in their products! They offer two cornerstone products that are both clinically studied and highly effective. The first is their probiotic, which has been clinically studied to help with leaky gut and to survive up to 1,000 times as much as other probiotics or the beneficial organisms in something like Greek yogurt for instance. The difference is, their spore-based strains work completely differently than other types of probiotics. Also, this probiotic is vegan, dairy free, histamine free, non-GMO, and is made WITHOUT Soy, dairy, sugar, salt, corn, tree nuts or gluten—so it's safe for practically everyone...I even sprinkle it in my kids food and bake it in to products since it can survive at up to 400 degrees! Their probiotic contains a patented strain called Bacillus Indicus HU36®, which produces antioxidants in the digestive system – where they can be easily absorbed by body. Their other product is a K2-7, and this nutrient—you may have heard of it—is known as the “Activator X,” the super-nutrient that Weston A. Price—a dentist known primarily for his theories on the relationship between nutrition, good health, bone development and oral health. He found this prevalent in foods in the healthiest communities in the world. Their K2 is the only pharmaceutical grade, all-natural supplement with published safety studies. Like the probiotic, this is also, gluten, dairy, soy, nut and GMO free. Both are best taken with food so I keep both on the table. My dad has trouble remembering to take supplements so he taped them to the pepper shaker, which he uses daily, and they're now on his daily list as well. Check them out at [justthrivehealth.com/wellnessmama](https://justthrivehealth.com/wellnessmama) and use the code wellnessmama15 to save 15%!

Katie: And it's also important to note, unfortunately, that things like psilocybin and MDMA are currently not legal in the U.S. at least. So while they show really promising results, and I'm hopeful for the future of those, they're not really accessible to most people, which is why I'm so excited for the Apollo. And I would love for you to really walk us through and explain it because when you and I talked about this, it kind of blew my mind. And I got the chance to try the prototype when I was with you and was amazed at how much of an effect I actually felt and the change I saw in heart rate variability in tracking it. So walk us through how the Apollo is both similar or different and what it's doing to the body?

Dave: So Apollo is the first wearable technology that uses gentle layered vibrations delivered to the body through a small wearable. It's about the size of an Apple Watch that can be worn on ankle or wrist and these frequencies have been proven in double blind, randomized, placebo controlled trial to show that we can enhance focus and calm and performance under stress by balancing the nervous system in near real time. And basically, the reason we developed these frequencies and we even bothered to explore this path was that I was seeing patients who had PTSD and anxiety and depression who were severely treatment resistant, not responding to anything else any other medicines or therapies because they just didn't feel safe.

And when they came into my office and we talked for an hour, they would say, "I feel so much better and I feel like I can make these changes in my life that we worked on." But then when they leave, they would instantly be triggered again and not be able to practice these things because they just didn't feel safe enough

to make those kinds of changes. And so I have a background in music and grew up playing music. I never was never very good but I always had a good, great appreciation for music, especially the way that it changed how I feel. And that I would use some music to study and some music to wake up and other music to help fall asleep. And that was always really interesting to me because I never understood why that works so well and why so many people got the same similar benefits from music.

And so I started talking to my patients about that and what they were using. And a lot of them use music to feel calm and use music to help them through their through their day and to feel safe and help them make change and interact in their engaged in their day to day lives more effectively. And many of these people also important to know, as a substance abuse psychiatrist, many of these people had drug abuse histories, which were oftentimes drugs that were prescribed to them by doctors and doctors who just didn't understand how to treat their conditions effectively and were sort of, you know, at their wit's end.

And so, for me, you know, working with these people, you know, psychedelic medicines can be very useful, but again, they're hard to access in a therapeutic way because they're not legal yet for the most part. And it's hard to find people who practice good medicine with these psychedelic medicines. And it's also not necessarily the best. Not everybody is a good candidate for a medicine. And so, you know, particularly kids and elderly folks, people with substance abuse histories. And so we developed Apollo using the theories that we understood of music changing the way we feel to give somebody the benefits of music and feelings and being able to regulate their daily bodily rhythms, circadian rhythms more effectively without relying on substances like coffee or alcohol or really more generally, stimulants and sedatives which are become a big part of our lives.

And to really show you that using something as minimal as a little vibrating pot on your wrist or on your ankle, that you have the capacity to control your energy levels, to decide when you want to be focused and awake, when you want to fall asleep, and when you want to meditate and calm down. And that over time using these and we now have over 1,500 people who have tried this in the wild with our wearable prototypes, and we found that overwhelmingly, people are using it in place of caffeine and in place of, you know, alcohol and sedatives at night to fall asleep. And it's having great benefit at least from the preliminary results in terms of symptom relief in some of these treatment resistant mental illness conditions.

And the most common thing that we hear from people, particularly people who have mental illness, is that it just helps them feel safe and they liken it to somebody holding their hand or giving them a hug when they're having a bad day. And that's exactly what we decided to do by sending these vibrations to the touch receptors in the skin. Just like when somebody holds your hand, that sends safety signals to your skin through the touch receptors in your skin through your spinal cord to the emotional cortex of your brain, which starts to block the fear center of your brain that may be overactive in the setting or trauma or chronic stress. And just having that little gentle input on a regular basis can help you to not only perform better under stress, but also to recover and sleep more effectively and sort of regenerate and your energy on a more regular basis.

Katie: It's so exciting to have technology and be able to use it in ways like this. And I know that a lot of the moms listening hear you say things like help you relax and go to sleep at night. And their immediate question is going to be is this, "Can this be used on children?" Because every mom wants her children to go to sleep a little more easily at night. So is this going to be approved for kids as well?

Dave: Yeah. So that's a great question. And I think going back into what I was saying earlier, we really designed this technology to be extremely safe and effective for us on vulnerable populations of people because those are the populations of people that aren't necessarily good candidates for medication. And so those populations include children and they include elderly folks and they include pregnant women and people who may otherwise not, for whatever reason, not the good candidates for medicine or not want to take medicine. And so we have a number of a pilot studies have been done in kids. And we are now in the process of starting studies with elderly folks in nursing homes as well as in pregnant women for postpartum depression.

But in kids, the results are really, so far, excellent. And we see that kids respond very, very well, particularly if they've have a history of trauma, a history of ADHD or depression. Their bodies are incredibly sensitive to touch. We know that in large part historically because when you look at the development of the emotional brain, the emotional cortex that's really at the center of our brain, which is referred to as the insula, this part of the brain primarily develops, starts developing in the last month of gestation in utero before the baby is born. And then that part of the brain develops mostly over the first two years of life, and then continues to develop over the next several years of life.

And so what we see is that it's critically important to nurture the development of that part of the brain with close human connection and touch in those early years when children are developing and we used to think that, you know, babies are babies and they don't have it fully developed brains and they don't need to have this kind of human connection early on from their parents or from anyone, and you can just, you know, leave them by themselves or let them cry or whatever it may be. But it turns out that that's absolutely not true. And that those close human connections are not only important for us as adults, but they're critical for the proper emotional development and nurturing of young children right after they're born, which is also why breastfeeding is so important because it facilitates a tight communication between the mother and the baby.

And just even having the eye to eye contact while the mother is holding the baby and breastfeeding creates an incredible emotional link between the child's emotional cortex and the mother's emotional cortex. And so all of this now have over time particularly the last 20 years really started to understand better. So, yeah. So Apollo provides these similar benefits. It's not a substitute for human touch. It's not a substitute for meaningful human interaction. But for people, particularly adults and children who don't have the access to these things on a regular basis, it can help to reduce some of the symptoms of anxiety and depression and irritability that can disrupt sleep and disrupt behavior and disrupt attention that ultimately result in these kids being prescribed medicines that they may not need or may cause undue harm.

Katie: That makes complete sense. And I'm so excited that these things are now available. I know people listening may want to know where they can find it and how they can try it. And of course, I will make sure

there are links in the show notes so they can connect with you and find out how to get an Apollo. But just walk us through that real quick how. When will this be available and how can it be used?

Dave: So Apollo will be available in the fall. And people can come to our website at [apolloneuro.com](http://apolloneuro.com) or [apolloneuroscience.com](http://apolloneuroscience.com) to get access to pre-order and reserve their first Apollo and be one of our first users. And I think important to know is that the use of Apollo is the onset of effect is typically very quick for most people. We see in the lab, it's about three minutes before your body starts to change in terms of heart rate and breathing and brainwave patterns.

And so what we typically recommend and how it's we designed the app and system to be used is intentionally so that you have a specific goal in mind and say, "I want to wake up. I want to focus. I want to meditate. I want to relax or I want to fall asleep." And you click on that for how long amount of time you'd like that effect to last for. And then the effects typically lasts for anywhere from 30 minutes to two hours after the vibration stops, which is consistent with how long healing touch or therapeutic touch last in the body as well. And so over time, what will happen is that the software will continue to learn about your body and the way that you interact with it to optimize the timing of delivery. And the specific settings that you receive so that it works better for you, the more you use it, and it grows with you and continues to teach you about how to be more mindful and how to be more present in your day-to-day life.

So that over time, similarly to practicing yoga or similarly to practicing meditation, Apollo, its effects seem to come on more quickly as you use it and they last longer. Because the people's nervous system becomes tuned and practiced to the Apollo effect, which is really critical and something that I think should we should not go without mentioning, which is that practice makes perfect. And I know my mom told me that. And probably a lot of our listeners have heard that before too. And I never really understood what that meant to me. But what I realized over the last few years that if you practice thinking about something in a certain way, or doing something in a certain way, whether it's good or bad, constructive or positive, you will get better at it.

And so if you practice being stressed out, or being traumatized or being upset or angry, you'll get really, really good at those things. And if you practice feeling calm under stress, being relaxed, being able to regulate your emotions more effectively, you practice honing your attention and focusing more frequently and concentrating, you will get better at those things. And so ultimately, what Apollo and meditation and breath work and all these things have in common is that they all effectively help the user to practice the skill of balancing your nervous system, which over time results in enhanced ability to recover and return to homeostasis more quickly, which has these ultimate impacts in terms of focus and performance and sleep.

Katie: That's so exciting. I cannot wait to get mine and you are such a wealth of knowledge. I knew our time was going to fly by quickly. And I think maybe you'll hopefully agree to a round two at some point, especially as we see things like hopeful legalization of certain substances. And we have more data on Apollo. I'd love to have you back and discuss it more. But toward the end of episodes, there's a few questions I love to ask. The first being if there are a few things that you feel like are misunderstood or not understood about this area of expertise?

Dave: That's a great question. I think there's a lot to talk about here. But I'll focus on a few things that I've been thinking about. I think the first is that the field of psychiatry and psychology is often stigmatized as this mental health field. It's not for everyone. And I would argue the complete opposite, which is that psychiatry and psychology is about healthy living through understanding our lives better and understanding ourselves better. And that has nothing to do with mental illness. And it has nothing to do with being, you know, looked down upon by society as less than everyone else. It has to do with being your best self and teaching yourself how to be your best self as far as much of the time that we're on this earth as possible. And when we start to embrace that understanding of mental health and psychology and psychiatry, it changes the way that we think about self-care and healing.

I think the second one is something we've touched on a lot, which is that the sense of touch is critical to health. Sense of touch overwhelmingly is probably the most neglected sense in our society. And we oftentimes keep distance from people around us that we're unfamiliar with, particularly in the U.S., whereas in Europe, a lot of European countries in Latin America, people often hug and kiss strangers. That's something that oftentimes doesn't occur in the U.S. And similarly, that often doesn't occur within families who are not strangers. And so there ends up being a deficit of touch that many of us face. And touch is one of the most critical senses to emotional nurturing and emotionally nurturing that sense of safety and love within one another and interconnectivity.

And so making sure that we have enough touch in our lives is really, really important and should always be on the forefront of our minds. And then I think the last thing would be that therapy is like the things we're talking about are tools to help us heal ourselves, not cures. There's this idea in western medicine that's been put out over the last couple hundred years, which is that healing comes from outside of us, and that you have to put something from the outside of us into our bodies to heal. And what has been, I think, and what we're moving towards now from understanding medicine a whole lot better in the 21st century is that these medicines and these things we put into our bodies to heal including food are and activities that we engage in are important, but they are really tools to help us access or open up states of healing that are always within us.

And that the healing that we want to engage in for whatever reason is that just to become a better stronger person or if it's to overcome an illness, the majority of that healing process comes from within you, starting with the belief or knowing that you can get better by making change in your life. And the medicines like psychedelic medicines or like Apollo are tools to help us access these experiences and seeing these opportunities more readily and integrate them into our lives.

Katie: I love that. Secondly, I love to ask if there's a book that has really dramatically changed your life, if so what it is and why?

Dave: So there's a couple, one in particular that has always stood out to me was actually referred to me by my dad when he found out that I was interested in psychiatry and mental illness. And the book is by Eric Kandel

who is a very, very famous psychiatrist and psychoanalyst who won the Nobel Prize in 2002 for discovering the mechanisms learning and memory. And he wrote a book called "In Search of Memory," which is an autobiography, but it's probably the best autobiography I've ever read because he didn't spend a lot of time highlighting everything that he did and how he is the best. But he spent a lot of time really going through in detail all the contributions that everybody made to the field that ultimately resulted in him, you know, winning the Nobel Prize and making these great discoveries about memory and learning.

And I think what's really important about his work is that Eric Kandel is a Holocaust survivor. And what you'll find when you start reading that book, which I highly recommend, is that his path to his ultimate discovery, making him a world famous scientist that has made incredible contributions to our field and our understanding of, you know, what it means to be human and how memory works, comes directly from trauma. You know, he had incredible trauma growing up and being a, you know, him and his family losing everything and being a victim of the Holocaust, and ultimately saw that as an opportunity to learn and grow and integrate that information as uncomfortable and traumatic as it was into a way to better understand how those memories are stored and how trauma affects us not only in the moment, but also over time, and what we can do about it by providing this cellular and molecular understanding of memory.

And so, if anybody is has ever thought about being interested in this area or if you are not interested in this area, I would still recommend that you check out this book. And it's something that anybody can read. It's written at a level that, you know, anybody can understand and I think it gives probably one of the best introductions to the most important discoveries in the field of neuroscience in the 20th century.

Katie: I will definitely check that one out, too. That's a new recommendation on here. Thank you for that. And lastly, any takeaways or final parting advice? I know we've covered so many topics and gone deep. And this is one of my favorite episodes to date, truly. But any parting advice to leave with the listeners?

Dave: I really appreciate that. Thank you. This has been really fun. I think the parting advice would be just reiterating couple things that we talked about earlier, which is that, you know, failure and mistakes and challenge are opportunities for growth. They are not opportunities for self-criticism or self-deprecation. I think it's important to have a healthy amount of self-criticism so that you can look at yourself objectively, or try to look at yourself objectively as often as possible. And you know, self-deprecation is an amazing form of humor. But ultimately, if we are afraid of failure and mistakes and challenge, then we're afraid of growth.

And we have to change our mindset actively to embracing challenge and failure is something that makes us better rather than something that brings us down. And the sooner that we do that, the sooner that you can realign yourself with a path of positive growth. And that's something that I work on with my patients all the time. And when they grasp it, that is when I see that the most dramatic that changes in their lives start to really take hold. And with that immediate, you know, I think it's also important to know that practice makes perfect. If you've been practicing being stressed out for years, chances are if you change your habits for a couple days or a month, you're not going to fix everything, it's going to take time. And it's important to be patient and compassionate with yourself and understand that these changes don't happen overnight.

There are certain things that can accelerate the process like Apollo or like psychedelic medicines. But in general, these changes require investment and effort and practice, just like the practice we put into being stressed out. And so by focusing on embracing challenge and embracing mistakes and to learn from them and grow and also to embrace practicing things that we really value that are these positive, constructive coping strategies in our lives, including the way that we approach stress and challenge, then all these things gradually start to take hold. And over time, people do see dramatic benefit, but you have to know that you can get better. And most people do. And so it's really about changing your mindset to understand that healing is possible and that healing comes from within. And that when we challenge ourselves and when we practice, that we maximize our potential to be the best people and the most healthy versions of ourselves that we can be.

Katie: What a perfect place to wrap up. And I do hope that you'll take me up on a round two someday, especially as there's so many exciting things going on in your field and with the potential legalization of these substances. So I'm really, really appreciative for all the work that you do and pushing this forward. And all of the research you've done and development of the Apollo. I'll make sure, again, all those links are in the show notes so that you can find them and learn more, as well as some resources that you pass along Dr. David, for people who are interested in understanding psychedelics and all of these treatments on a deeper level. But I cannot thank you enough for your time. I know how busy you are. And I'm honored you took the time to be here today.

Dave: Thank you so much, Katie. And I'm honored to be here and I'm so grateful for you having me on the show. And I would love to come back on and talk more about these things as we get updates from these trials and from, you know, the new exciting technological developments that are coming our way.

Katie: Amazing. And, of course, thanks to all of you for listening and sharing one of your most valuable assets, your time, with both of us today. We're so grateful that you did, and I hope that you will join me again on the next episode of the "Wellness Mama Podcast."

If you're enjoying these interviews, would you please take two minutes to leave a rating or review on iTunes for me? Doing this helps more people to find the podcast, which means even more moms and families could benefit from the information. I really appreciate your time, and thanks as always for listening.