



MIGRAINE WORLD SUMMIT

INTERVIEWS WITH WORLD-LEADING EXPERTS

TRANSCRIPT



BRAIN RETRAINING FOR CHRONIC PAIN

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Introduction (00:05): If you pay attention to the sensations that you're having and reinforce the belief to yourself that you are not in danger and that there is no threat to your body, that you're OK, and reinforce the belief that what's happening is that your brain is activating a hyperactive pain response. And describe the sensations you're feeling in noncharged language: so using words like "tight," or "warm," or "tingling," as opposed to "painful" or "bad." What you start to do is use other parts of your brain to respond to what's going on, and you're using those other pathways. When you use other pathways in your brain, they slowly get stronger and stronger.

Kelly Hayes-Crook (00:45): Many of us with chronic migraine struggle with daily symptoms. Sometimes it feels like our brain has its own mysterious agenda. Medications and other treatments may help for a short time or not at all. At times, side effects outweigh the benefits of medications. For some, lifestyle changes may help but the symptoms continue. In this interview, we are going to explore brain retraining, a growing area in chronic pain research and therapy, based on the concept that chronic pain is due to changes in the brain and can be unlearned. Our expert on this topic is Dr. Bethany Ranes, who is a cognitive neuroscientist, a field that bridges neuroscience and psychology. Dr. Ranes, welcome to Migraine World Summit.

Dr. Ranes (01:33): Thank you.

Kelly Hayes-Crook (01:34): What is brain retraining?

Dr. Ranes (01:38): So, brain retraining is a new approach that we've been looking at for chronic conditions, and it's been particularly promising for pain conditions, but we're also seeing it for a number of things that don't have a clear physical cause. What we're doing is we're applying a lot of modern science, particularly neuroscience, to ways that we can approach these issues that really mirror their root causes a bit closer.

Kelly Hayes-Crook (02:01): Brain retraining is a big shift in how we traditionally think about pain. Many of us understand pain based on the biomedical model. However, brain retraining is based on the biopsychosocial model. Could you explain both models?

Dr. Ranes (02:19): Yes. So, the biomedical model is actually quite old. It goes all the way back to Descartes in the 17th century, and it basically says that the mind and the body are completely separate entities. So, if you have a problem in your body or you have a physical problem, any kind of symptom that seems somatic, then it must be a problem that has to do with the body, and therefore you need a body-based solution. Likewise, in the mind, if you have something that has to do with emotions or trauma or cognition, well then it must be a problem of the mind and requires a mind solution. And the biomedical model, kind of "ne'er the two shall meet." What we know now, for more modern science, is that the biopsychosocial model seems to hold up much better to what we actually see in the real world. The biopsychosocial model is based on things like neuroscience, biological psychology, and social psychology, where we are understanding that the way that the brain, the environment, and the body work together is very seamless and complex and highly interrelated.

Kelly Hayes-Crook (03:20): How does brain retraining differ in the biomedical and the biopsychosocial models of pain?

Dr. Ranes (03:28): So, what I love about brain retraining is that it brings in some strengths of both models. What you have is something where we are approaching the issue from a biopsychosocial perspective, where we understand that physical issues can manifest from



psychological or environmental stressors, but we also are taking into account just the basic biological function of our brains and bodies. And so, what brain retraining does is it takes an approach where we know that what happens in our brains to control our bodies is based on these neural pathways, and they are just the ways that our brain cells make paths and roads throughout our brain and how they interact together. We used to think that a lot of that was kind of set in stone and couldn't be changed, especially after childhood once we become an adult. And what we've actually found through the technology of our modern day is that you can change those often. And so, what's really exciting is that we can take things that maybe have even caused problems for years or decades for some people. And by working with them to help reshape and reappraise and consider new perspectives, we can actually change those pathways in the brain, and therefore we're changing the relationship between the brain and the body.

Kelly Hayes-Crook (04:45): In 2020, pain was redefined by the International Association for the Study of Pain as: "An unpleasant sensory and emotional experience associated with or resembling that associated with actual or potential tissue damage." Nociception was defined as: "The neural process of encoding noxious stimuli." Could you elaborate on the difference between pain and nociception?

Dr. Ranes (05:15): So, nociception is a very biological process. We don't really feel it. It's the special transmission of messages from the body to the brain through a part of your nervous system that is specifically designed to identify damage. So, if you damage or harm something in your body, nociceptors are what tells your brain that something happened and where it happened. We, again, don't feel this process; that process is completely objective. What we feel is pain. Now pain is what happens once that message gets up to the brain. And pain is a very complex experience, and it's learned, and it's actually got a lot more in common with an emotion than it does in a purely biological process, because we have so many memories and personal experiences and beliefs that tie into pain that really shift how it plays out for us. Now, pain doesn't need nociception to happen. Pain can actually also be activated by other parts of the brain. So, what's really interesting and what we've very recently learned is that things like social rejection, or emotional hurt, also activate the same parts of the brain that turn on our pain experience.

Kelly Hayes-Crook (06:34): An initial reaction may be, "Are you saying my pain is not real?" Is that how you would interpret this?

Dr. Ranes (06:43): Not at all. No. Whenever the pain activation centers are, you know, sort of lit up, as I said, the pain is very real and it doesn't matter where that's coming from, whether it's nociception based, or if it's coming from a threat in your environment. All the pain that you feel when those pain centers are activated is extremely real. And I think one of my favorite things I've heard to kind of address this, my colleague Dr. Howard Schubiner has a saying, I've heard him say many times. He says: "All pain comes from the brain and anyone who tries to claim that your pain is not real is either uninformed, cruel, or both." We don't really feel nociception, and so, that pain experience is all we know. There's absolutely nothing there to suggest that there's real pain, or "faux" pain, or "made-up" pain. That's just all our brains are actually able to know.

Kelly Hayes-Crook (07:38): Two more important terms used in brain retraining are structural pain and neuroplastic pain. What do these terms refer to?

Dr. Ranes (07:48): Structural pain is when we have something going on with our hardware, with our bodies. There is a structural explanation, there is damage done to the body — to the tissues



of the body. Generally, structural pain is something that also can heal and just needs to be treated and allow your body, and whatever other interventions you have, to heal it over time. Neuroplastic pain is a bit more complicated, but it's also quite a bit more common. Surprisingly most chronic pain examples are something that you can tie back in, in some part or in whole part, to neuroplastic pain.

Dr. Ranes (08:23): That's that top-down signaling where if you have sort of associated, and kind of created this belief that something is connected to pain, your brain will activate the pain centers as a result of being exposed to that. So, it's sometimes called stimulus response, right? Or something that's learned, something that has an association. And so, what happens is that those pain centers in the brain are activated in response to a nonthreatening, nondamaging stimulus. Maybe sitting in a certain way, certain weather, things that are going on just around you that you've learned to associate with pain. They actually do start to create real pain in the brain.

Kelly Hayes-Crook (09:08): How can we tell the difference between the two when we feel pain?

Dr. Ranes (09:13): So, when you're feeling pain, it can be quite difficult to tell the difference between them, and it takes a little bit of assistance. It's really helpful if at all possible to have structural pain, what we call in healthcare, "ruled out," where you can work with somebody to make sure that there is not a structural issue happening to cause the pain. That's a good starting point. The downside of that is unfortunately a lot of physicians have been trained exclusively in a biomedical model. So they believe that if you're feeling physical pain, well there must be a physical reason and sometimes they'll sort of go fishing a little bit and they'll scapegoat something that doesn't necessarily correlate with pain. But there are also things that are really helpful that we can do when pain occurs. If you observe there are patterns to neuroplastic pain that can help to identify it, kind of on its own.

Dr. Ranes (10:07): Alan Gordon has laid out a lot of these in his work and in his book *The Way Out*. So, things like if the pain originated or tends to correlate with stressful events in your life; if it changes in intensity throughout the day or throughout different activities; if there's lots of different symptoms, you tend to have a lot of different symptoms, but no structural systemic issue to explain them; if they spread or move around the body; if they mirror. So, for example, if you've hurt your left knee, but then you start to have pain in your right knee over time.

Dr. Ranes (10:44): And one of the bigger ones that we've noticed over time is childhood adversity. If you have a history of a rough childhood, whether that's what we call like a "big T trauma," so adverse childhood events — you may have heard those called ACEs — or just kind of a rough go, a rough childhood. All of these things can really lead to neuroplastic pain. There are also some personality traits we've noticed that tend to correlate a lot with chronic neuroplastic pain: Things like perfectionism, people-pleasing, and anxiousness can all really kind of tie in. So, when you're noticing those patterns together, there's a very good chance that you're experiencing neuroplastic pain.

Kelly Hayes-Crook (11:24): That list is very helpful. So, what role do our thoughts, feelings, and emotions play in our own pain perception?

Dr. Ranes (11:36): So, going back to something I said earlier, I kind of briefly mentioned the amygdala, which is sort of the "king of the court" of our threat-detection systems in the brain. And the amygdala does not just get activated by things out in our environment. Of course, it's



very helpful when it's activated by things like bears or you know, things about to fall down on us, but it actually can be activated internally by distressing thoughts, memories, and feelings, as well. So, if you have a lot of distressing thoughts or negative thoughts, anxious thoughts, you can activate your amygdala that way. And in folks who have chronic neuroplastic pain, that commonly ties into hyperactivity between the amygdala and the pain centers.

Dr. Ranes (12:20): And that's sort of why we see it correlate with stress and those feelings of anxiety often. So, when you're thinking about those things — it's a bit like a wire that's just a little too live, right? It's a pathway that's just a little too hyperactive between those two things. And in brain retraining therapy, what we're targeting is that pathway to sort of reduce the hyperactivity between the amygdala and the pain centers so that when you have these thoughts, these stressors, one way we can reduce it is by helping to reduce somatic thoughts if that's possible through therapy. But the other is to make sure that they're not activating the amygdala so that your pain center is also activating at the same time.

Kelly Hayes-Crook (13:01): If thoughts and emotions are factors, does that mean that the pain is my fault? Why would our brain give us pain?

Dr. Ranes (13:10): Oh, it is absolutely not anybody's fault at all. These are fully automatic processes that our brain does without any input from us for the most part. That's the difficult part of brain retraining, in fact, is to try and put yourself into these automatic processes to slow them down and make them less automatic over time. So, practicing that is — often we call it mindfulness, right? Which is kind of a very broad term for lots of things. But by no means is there any kind of fault there and we can go in and change these things. And it's not because we've suddenly decided not to be in pain or decided not to have symptoms anymore in that way that we were creating them in the first place, but that we're realizing, "Hey, I think I have some brain pathways that need some attention." And then kind of consciously working on them to change them, train them, and relearn them in a different way.

Kelly Hayes-Crook (14:07): The "Boulder back pain" study is used as evidence that brain retraining — specifically pain reprocessing therapy — is an effective strategy for chronic pain. Could you tell us more about this study and the quality of the evidence?

Dr. Ranes (14:21): Absolutely. It was a very exciting study for those of us in this field because this was an opportunity to not only look at the outcomes of pain reprocessing therapy, but to also look at the changes that are physically occurring and functionally occurring in the brain because it incorporated neuroimaging, fMRI. What we saw is that people who came into the pain-processing therapy condition, many of them had had pain for many years — I believe the average amount of time was about 11 years— had chronic back pain. We saw that 66% of them in four weeks got to a point of having no, or almost no pain, which was pretty amazing for them because they had lived their lives in quite high levels of pain. We also saw that when we looked at their brains, there was a significant change in that connectivity between the amygdala and the pain centers in the brain.

Dr. Ranes (15:18): So what was very exciting, I think for me as somebody in my field, is that we saw that this is acting on the root cause that we were hoping and hypothesizing that it was acting on. That we're actually changing those neural pathways between the amygdala, the fear and threat centers, and the pain centers. So that even when you do have a stressful day, or maybe you even have a pain relapse that shortly comes in, you don't have that same hyperactivity in the same way and you're able to more easily say, "I know I'm OK, there's no



danger here," and you can move forward and address that pain so much more easily after having these therapies. The other exciting part of it is that we saw that these results lasted up to a year after therapy had been completed. So, they're incredibly durable and they tend to be very self-reinforcing.

Kelly Hayes-Crook (16:08): What were some of the specific therapies used in this study?

Dr. Ranes (16:12): This study was specific to pain reprocessing therapy, which is a brain retraining therapy developed by Alan Gordon. A big part of PRT, as it's called, is somatic tracking, although it does have other techniques, as well. But I think somatic tracking is a really interesting component of it because what it essentially is, is like a form of exposure therapy. With somatic tracking, what we find with the amygdala activation is that there's a fear of pain, or a fear of an activity that might cause pain.

Dr. Ranes (16:44): What PRT has done and what somatic tracking does is turn that into an opportunity for exposure. So when someone is in a low or moderate state of pain, not a high state of pain — it's very difficult to do mindfulness when you're in a high state of pain and in that point it's really more about getting that pain level down through whatever means you can. But when you're in a low or moderate state of pain, if you pay attention to the sensations that you're having and reinforce the belief to yourself that you are not in danger and that there is no threat to your body, that you're OK, and reinforce the belief that what's happening is that your brain is activating a hyperactive pain response. And describe the sensations you're feeling in noncharged language: so using words like "tight," or "warm," or "tingling," as opposed to "painful" or "bad." What you start to do is use other parts of your brain to respond to what's going on, and you're using those other pathways. When you use other pathways in your brain, they slowly get stronger and stronger.

Dr. Ranes (17:46): There's a famous saying that you may have heard, that "neurons that fire together wire together." The more you can kind of think of things in a different way, in a different perspective, you're weakening the more hyperactive connections that you've had in the past, and you're creating new ones and strengthening those instead. So, that's a big part of it, but there's also a lot of learning that goes into it so that you can believe that there is no pain. You need to understand the neuroscience of pain, kind of like what we've been talking about today. Making sure you're practicing self-compassion, which is a huge one, and just allowing and expressing emotions because we find that emotional suppression can also really lead to a lot of issues with this.

Kelly Hayes-Crook (18:28): This research was based on back pain. Is it relevant for other types of pain including migraine?

Dr. Ranes (18:36): Yes. Back pain is often the most commonly reported chronic pain, but it's certainly not particularly special in that regard. Chronic pain conditions all sort of have a very similar mechanism. Migraines also tend to have a lot of neuroplastic sort of similarities and characteristics when it comes to that amygdala activation and pain centers of the brain. So we see a very similar hyperactivity for people who are experiencing migraines as we do people who experience other types of chronic pain.

Kelly Hayes-Crook (19:09): You were involved in a study specifically using pain reprocessing therapy in 2020. Are you able to share any information about the approach and what was learned?



Dr. Ranes (19:21): Yeah, I actually specialize in an area where it's a bit different than clinical trials. So, the "Boulder back pain" study was what we would call a clinical trial. I tend to do studies in a more translational context where we actually take something that has shown effectiveness or promise in that clinical-trial world and see what happens when we throw this into a real clinic, a real-world situation. And that's what we did for the study I was involved with, where we had doctors who weren't as familiar with PRT and had to learn about it. We had to put together referral systems for counselors and physicians to work together. We had to work with patients who had never ever heard of neuroplastic pain before, had no idea what it was, and most of them were convinced they had structural pain even if their pain had lasted for decades. So, it's a very important way to look at therapies and their ability to what we call scale, or be a larger solution out there in the real world. Of course, you tend to get slightly messier results, but what was very exciting is we still saw very promising and positive results with our patients.

Kelly Hayes-Crook (20:27): Was there any distinctive reasons why some were successful and others were not?

Dr. Ranes (20:35): Yes. One of the biggest issues with brain retraining is belief, actually. And really having that understanding that your body is safe has to resonate very genuinely in order for the neural connections in your brain to truly change. It's really, really important to have a trusted person that can really help set your mind at ease. And we saw that that was really important and probably the most difficult thing in the real world to do. Because unfortunately, not only do you have to help a patient unlearn these connections in their brain, you have to help the physicians unlearn years of biomedical training that told them, if you're feeling pain in the body, the problem must be in the body.

Kelly Hayes-Crook (21:17): Specifically going more into migraine, pain is only one of a long list of symptoms of migraine. Can brain retraining have a positive impact on other symptoms like nausea, brain fog, vertigo, sensitivity to light, sounds, smells?

Dr. Ranes (21:36): Yes, there's some really interesting research out there. Again, a lot of it on the neuroscience side is looking at fMRI on that connectivity to the amygdala. What I found really interesting is that migraine — folks who experience migraines — what they have is not only a connectivity issue from the amygdala to the pain centers, which is very common. They have a hyperactive amygdala connection to their sensory areas as well — their sensory-processing areas. That may sound a little familiar because we've been talking about this. So, in addition to pain symptoms, people who experience migraines may also have these sensory-related issues that are hyperactively tied to their amygdala. When they're in a situation that's threatening or perceived as threatening, they have threatening thoughts. Anything that activates that amygdala, again, can very well activate a number of these sensory symptoms.

Kelly Hayes-Crook (22:29): Migraine itself is considered a chronic condition, however, the variation and the frequency vary considerably over time, in between people. Who with migraine is best suited for brain retraining strategies?

Dr. Ranes (22:45): If someone has experienced migraines in a chronic nature, particularly those who have a great deal of variation in their symptom presentation, there is a very strong chance that they're a candidate for these neuroplastic therapies. So, actually that variation in frequency and intensity is a strong indicator that what's happening here is a neuroplastic issue because threat detection is in and of itself very hard to predict. It jumps around. Sometimes things might



be more threatening than others, some days you might be more prone to being threatened than others. And so, that variation is a good indicator that you're having something that's tied into the amygdala, as opposed to a consistent structural problem which doesn't move, really doesn't change very much, and doesn't go away. Any kind of chronic condition that lasts longer than a few months — that's usually about how long it takes for a structural issue to heal — is usually a fairly good indicator that these brain retraining techniques are likely to work very well.

Kelly Hayes-Crook (23:45): Movement and exercise seem to be an important component of reducing chronic persistent pain using brain retraining. Why is movement helpful and how do we reintroduce movement when it triggers a migraine attack for some?

Dr. Ranes (23:59): Sometimes movement and exercise are thought to be the sole source of relief or recovery in some therapies, and actually that's a bit of a fallback to a biomedical approach because movement and exercise tend to be very body-based. I would honestly recommend that instead of focusing on, "I have to be able to do these movements and therapies to fix my body so that my symptoms go away," patients and people who experience these symptoms really should more likely think about, "Why am I worried about moving? And does moving actually cause damage or danger to my body that is causing symptoms?" Approaching it very much like other stressors that you would do in a brain retraining therapy.

Dr. Ranes (24:42): And as a sidebar, I will say, once somebody is able to achieve exercise, a big part of the reason it's considered important is that exercise is one of the best things we can do for something called neuroplasticity, which is essentially the underlying process of these brain pathways changing. The more you are able to move, the more your brain tends to be responsive to creating new pathways and helping you to create these new ways of communicating in the parts of your brain. It can be very helpful.

Kelly Hayes-Crook (25:13): Nancy from our community asked: Is retraining the brain still possible even if one has been experiencing migraine-related pain for years?

Dr. Ranes (25:24): Absolutely, yes. Again, honestly, if you've been experiencing these things for years, you are likely to be a really ideal candidate for these therapies. So, do not lose hope if you've been experiencing symptoms for a long time. I will say that the longer you've been experiencing symptoms, the stronger the neural pathways and connections that are causing the issues may be. And those things are all changeable. So going into it with a sense of optimism, knowing that science is on your side, your brain can be retrained even after many years. We've seen people have success after decades of chronic pain or chronic symptoms.

Kelly Hayes-Crook (26:00): What first steps, or resources would you recommend for those who would like to learn more about brain retraining?

Dr. Ranes (26:08): I would say for people who are specifically interested in PRT or pain reprocessing therapy that we used at the "Boulder back pain" study, you can check out *The Way Out*, which is a book by Dr. Alan Gordon, who invented or founded that style of therapy. Then there's also a really fantastic book called *Unlearn Your Pain*, which is by Dr. Howard Schubiner. And it's a bit more of a workbook that helps you through some exercises to learn more about pain and things that you can do to change it. There's also an app called Curable, which is a really fantastic resource. It has a lot of really great podcasts — for anybody that's a big podcast fan — that explains a lot of these fairly technical issues in really straightforward, easy-to-understand language that can be really powerful. So I'm a big fan of that, as well.



Kelly Hayes-Crook ([26:57](#)): Could you tell us a little more about the Healing Track?

Dr. Ranes ([27:01](#)): Yes. So, after the success we've been seeing with pain reprocessing therapy, we're really excited to get it into a scalable source where we can get it out to lots and lots of people. We've seen that a lot of folks have a great deal of success working on their own in these brain retraining therapies. And what Healing Track is going to do is offer a tiered-level of care for people who maybe just want some digital access to the resources to work on it on their own. Some people do need to see and work with therapists, but not everyone does. And so, what we're also offering is sort of a middle ground where people can work through the materials, understand and teach themselves how to do this, but also work with a coach that assists them, helps to answer questions and clarify what they need to do.

Kelly Hayes-Crook ([27:47](#)): Do you have any final thoughts to share with our audience?

Dr. Ranes ([27:51](#)): Yes. I think one of the biggest things I really want to underline is that there's no shame or stigma in experiencing any kind of neuroplastic condition. I hate the idea that anybody would think that the way that their brain has wired over their lifetime, as a series of events that are largely outside of our control, is anything that we have to be ashamed of or to feel like we have some sense of fault in. The things that have happened that create neuroplastic pain and other neuroplastic symptoms are fully outside of our control. They were our brain's best attempt at adapting to something that was likely very traumatizing and unfortunate at the time. And it's just unfortunate that whatever that happens, our brain tends to write them in ink rather than in pencil to avoid those kinds of fearful or dangerous things happening to us again.

Dr. Ranes ([28:40](#)): And that's where this all comes into play, and over time they just tend to reinforce themselves. And so, anybody who's worried about, "I can't believe I have this," or, "I'm afraid I have this," or, "I'm ashamed of this," please don't be, because there's nothing about neuroplastic pain that isn't just as functional and organic as structural pain in your body.

Kelly Hayes-Crook ([29:00](#)): Where can we learn more about what you are doing, or follow your work?

Dr. Ranes ([29:06](#)): I actually have a blog that I like to talk about some of these things. I realize that neuroscience is not the most approachable science out there for most people, and so I really enjoy taking some of these topics and making them a little bit more digestible for folks. I have a website that's just www.branesconsulting.com. And I also link to a lot of my blog posts and talk about a lot of these topics on LinkedIn.

Kelly Hayes-Crook ([29:37](#)): Dr. Ranes, thank you so much for joining us at Migraine World Summit and sharing this valuable information on brain retraining.

Dr. Ranes ([29:45](#)): Thank you very much for having me. It's been a pleasure.