Changing gene expression to calm anxiety

Guest: Dr Kara Fitzgerald

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[00:00:10] Alex Howard

Welcome, everyone, to this interview where I'm super excited to be talking with Dr Kara Fitzgerald.

Firstly, Kara, welcome and thank you for joining me.

Dr Kara Fitzgerald

Absolutely. It's always great to get to hang out with you, Alex.

Alex Howard

Yeah, we always have fun. And it's also really nice to connect with you post publication of your new book, *Younger You*, which it sounds like has been doing awesome.

We're going to talk about some of the ideas and principles within that, but also specifically getting into aspects around genetics, epigenetics, and really understanding how we can transform our DNA, which is super exciting.

Just to give people a bit of Kara's background. Dr Kara Fitzgerald is the first ever recipient of the Emerging Leadership Award from the Personalized Lifestyle Medicine Institute in recognition of her truly exciting work on DNA methylation.

She received her doctorate in naturopathic medicine from the National University of Natural Medicine. She lectures globally on functional medicine, is on the faculty of IFM, the Institute of Functional Medicine, and is an IFM certified practitioner with a clinical practice in Newtown, Connecticut.

She runs a functional medicine clinic, an immersion program for professionals and hosts the podcast, which I'm grateful to be on, *New Frontiers in Functional Medicine*.

Dr Fitzgerald is also actively engaged in clinical research on the DNA methylation using a diet and lifestyle intervention developed in her practice. And her first study was published in the *Journal of Aging*, and she's recently published the book, *Younger You*, an application based program and 3YY based on the study. She lives with her daughter in Connecticut.

Kara, I think a great place to start this would be to talk a bit about what genetics are, what epigenetics are, and a bit about the relationship between the two of them.

[00:02:10] Dr Kara Fitzgerald

Awesome. And Alex, you have carte blanche to stop me at any time if I go into the rabbit hole too far or if I need to define something.

Alex Howard

You also know how much I enjoy a good rabbit hole.

Dr Kara Fitzgerald

Well, yeah, let's go get lost in the tunnel.

So genetics, so our DNA, if we think about a computer analogy, we could say our DNA is our hardware and our epigenetics, epi-above genetics. Again, our DNA, our genetic material is the software or the operating system that dictates what gene or what program is on or off.

So DNA doesn't change. Mutations that are transferred through a population are, as you know, very slow to happen, take millennia. The whole evolutionary process and is therefore not remarkably impactful.

So I just want to give you an example so it's not impactful in the short-term. I just want to illustrate it by going back to when we mapped out the human genome. So when we were able to identify all of the genes present. We've got about 23,000, much less than most plants and maybe a little bit more than some animals.

So it's not a ton. We anticipated when this happened in the early 2000s to really be able to say this gene causes this disease. We anticipated it being a Rosetta Stone for all of the diseases that we're facing.

Instead, there was this audible disappointment or audible sigh that our genes were not a Rosetta stone. They weren't defining the cause of all these chronic diseases. It doesn't sit in your genetics. And there's a new lens that we're looking at it through, and I just want to try to pin that over here so that we can come back to it.

So with that piece of information, realizing the genes weren't our destiny, attention turned to epigenetics. Epigenetics, the term has been around for, I think it was actually first coined in the 1800s, but there's been some degree of attention to it for a long time.

But after the genome was mapped out, we just research in that area, just was galloping, galloping, galloping forward, because if our genes aren't our destiny, then it must be what's regulating which gene is on and which gene is off, and this is the field of epigenetics.

Epigenetics is influenced by the choices that we make every day. So this is where environment meets gene expression, what we're eating, how well we're sleeping, our stress load, the toxins that we're exposed to, our interpersonal relationships. Actually, there's a new study out looking at twins, and when they cohabitate, their epigenetics are much more in alignment.

Now, I'm a mom of an adopted girl. I've been with her since day one, since the day that she was born. I don't share my genetic material with her, but I have no doubt our epigenetic material has interfaced and that we share that relationship. So that's the genetics that we share. And it's really extraordinary.

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Now amazing, and you and I were talking about this before we hit record, is that some of these patterns can actually be inherited over time. So we look at genetics and evolution and the slow movement of mutations taking place and being meaningful and then transferring through society. It takes millennia.

Epigenetic heritable patterns can happen in a single generation, and they can remain. They can be resilient in a population over time, but we also wipe clean a lot of it. So it's only a small portion of epigenetic information that's passed from generation to generation.

And I want to stop there and see if you have any questions.

Alex Howard

Well, I think one of the questions that comes in is if we recognize we've got these various factors that we come in with, but then we've got the ways that we are shaped by life and by experience, I think one of the fears that people have is, this is how I'm always going to be. That it's like, in a sense, our biology or our genetics become a predetermined destiny.

Dr Kara Fitzgerald

That's exactly right. So this whole nature nurture debate, we have believed that it was nature forever. Our genes are our destiny. Okay, mom, and dad are healthy. Grandma and grandpa are healthy. I'm healthy. Regardless of what I do, I'm going to be healthy. I can eat horribly, I can smoke, etc. My parents live to be a long time. I'm going to live for a long time.

Or conversely, I'm going to be a victim of the smattering of diseases that are present in my family. Like, we all get cardiovascular disease, we all get diabetes and therefore, that's going to be my fate and so I don't need to eat healthy because I'm going to get it anyway and blah, blah, blah.

So, yes, we've been living, I think, by and large, under the impression that our genes are our destiny and we have no control. So the promise of epigenetics, even though I did start by mentioning this heritable component, a small heritable component, but the promise of epigenetics is that it's the opposite. We're moving to nurture now.

Our genes are not our destiny. We have a massive say over how well we live. And if we're going to have kids, we actually have some say over how well they're going to, what we pass on.

It's an extraordinary revolution that we're in the midst of realizing how much they have. And as Jeff Bland, our friend and colleague, and I'm sure he's a mentor to you, as he is to so many of us here in the States, says, this new knowledge comes with great responsibility. There's something easy about saying, I'm a victim of my genes, be it good or bad or whatever thoughts you have around what your genes are.

In fact, no, we have a lot to say about it. We have a lot of influence over how well we live. And there is great responsibility there.

[00:08:56] Alex Howard

Because I think part of what the developments in research and some of the frameworks methodologies have done is they've helped us understand the impacts of genes, the impacts of early life experiences, the impacts of adverse childhood experiences.

And that frame of understanding is really helpful, but I think what can sometimes happen is it also becomes a prison because it's like, oh, well, now I understand why I'm this way. It's due to this and I have this snip and I have this experience, and that's happened.

Therefore, I have my problem and I'm better off to understand my problem, but what I'm not necessarily is empowered to recognize that that's the data that can inform my pathway out of this prison. Can it effectively give me strategies to move forward?

Dr Kara Fitzgerald

100%. We know that a PTSD experience in a previous generation, a grandparent, a great-grandparent, a parent, can shift epigenetics towards increasing our tendency to become stressed at smaller events, or it can even bias us towards perhaps a little bit more inflammation. I mean, we can see increased risk for some of the chronic diseases, so we can see a heritable pattern.

Conversely, if you experience early childhood stress, I shouldn't say conversely, that can also create the same dynamic with regard to epigenetics, with regard to gene expression. So you're not changing your DNA, but you're changing what genes are on. You're influencing what genes are on and off. And that can be a negative influence, a little bit more inflammation, a lower stress threshold.

So we can see these things. However we can absolutely, so these are not written in stone, and we can make some changes around epigenetic expression. And that was what we looked at in our study specifically.

So one of them, a cornerstone epigenetic mark, as they say, so the different biochemical processes that turn genes on and off, a cornerstone one is called DNA methylation. And that's what our study was looking at.

And we showed conclusively within our study group that their DNA methylation patterns changed considerably. And we were looking at biological age or how fast the body is aging. And we could see that we were able to change epigenetic expression more favorably in this population.

And other studies have shown favorable epigenetic changes with meditation practice or with exercise or certain nutrients. It's a hotbed of research right now, and it's very exciting.

So what I would say is, regardless of where you may have gotten a bias towards an easier, a lower stress threshold or you're more likely to experience stress at a less intense event, or if you think that you've inherited some negative patterns from prior generations, right now, you can move in and start to eat and live for optimal gene expression.

There are many things that we can do, and we're only beginning to tap this, to mine this whole area of investigation. So now we can see the heritability components of things like PTSD and depression, etc, but we will be nailing down what resilience looks like and how to turn the volume up on supporting resilience.

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We may be able to actually, at some point in time, so Moshe Szyf, who was a study advisor, he's a really highly regarded epigeneticist out of McGill University, thinks that they'll come a time when we'll be able to identify these patterns even before birth, like in utero or in earliest infancy. And change these patterns and build in resilience using, in his mind, we'll be able to use benign interventions like SAMe, S-Adenosyl-l-methionine, the universal methyl donor, which you can buy in most vitamin shops. And so he thinks some pretty gentle interventions will help.

What I can say is that we see, again, the research supports one experience of meditation. So just one meditation activity can favorably change gene expression. And we see in practice meditators that there's much more favorable gene expression. It's more deeply rooted. Practice meditators are biologically younger. They have less inflammation, reduced risk of some of the chronic diseases, etc.

So I guess, I need to stop and let you comb this out, but there is much that we can do to change gene expression. Even gene expression that appears to be entrenched in our DNA, because I don't think that it's necessarily our DNA. I think it's our epigenome, and our epigenome is changeable.

So this is a time of really great hope. And I would say, actually, let me say one thing. I'm going to shut up, I swear.

When we know that about ourselves, when we know perhaps we tend to get stressed out a little bit quickly, or we know if we experienced adverse childhood events or we had a stressful childhood, or maybe our parents did or our grandparents, when we have that piece of information, we can be kinder to ourselves knowing there is a bias in gene expression, but it's a bias that we have some ability to change.

So this is without question a hopeful message. I want it to be a hopeful message.

Alex Howard

I want to come a little bit to some of the practical pieces around food lifestyle, which you started referencing, but let's go a bit more into DNA methylation and also the concept of biological embedding.

Dr Kara Fitzgerald

Absolutely. A cornerstone mark, as I said before, is DNA methylation. And this is very simple. So a methyl group is a carbon with three hydrogens on it. It's one of the most basic molecules. I have one kicking around here. I have a little model. Anyway, I don't know where I put it. I have a little methyl group that I could share. It's just a carbon and there are three little hydrogens popping out of it.

Alex Howard

You haven't been tempted to get it tattooed on your wrist or something. Just pull it out.

Dr Kara Fitzgerald

I should get some really cool molecule on. That's funny. I should do that. Anyway, take note.

[00:16:00]

So in science, this methyl group, when it's related to gene expression, it's a red lollipop. So just envision a bunch of red lollipops. And when these are sitting on the promoter region of a gene, a lot of these red lollipops, just imagine it actually blocks access to the gene itself. So a bunch of methyl groups lying up, placed on the gene and the promoter region inhibits access to the gene, and that gene is suppressed.

Conversely, there can be an absence. So on the promoter region, there can be an absence of methyl groups or very few methyl groups, and that gene is able to be turned on.

Every cell division in our body, when we're rebuilding DNA is an opportunity for us to change what's happening here. And we can actually do it even outside of times where we're engaged in cell division as well. So we can actively take methyl groups off and we can put methyl groups on. It's really pretty extraordinary.

So this is DNA methylation. DNA methylation, just to underscore how important it is, defines the fate of pluripotent stem cells. So in embryogenesis, it's DNA methylation and demethylation that actually scrubs clean all of the methylation information from previous generations. It doesn't scrub it completely clean. That's the little heritable region in there. But it scrubs clean, and then it lays new stuff down.

So it'll define a skin cell, hair, heart cell, etc, it's methylation. So it's an incredibly important epigenetic process.

Now, biological embedding is the translation of our emotional experience of our life experience into these methylation marks. So it's like the psychic experience becomes biochemical and influences what genes are on and off.

So biological embedding is the experience being embedded into the genome and influencing what's on and off.

Most of the research, in fact, it's been argued that an excessive amount of research has been focusing on the trauma paradigm. Again, looking at adverse childhood events or PTSD. There was a really interesting study looking at an ice storm in Quebec and women who were pregnant during this ice storm gave birth to kids who had higher rates of autism and allergies.

So there tends to be a trauma piece, but we will understand at some point, I have absolutely no doubt about it. And we're looking at it in the Holocaust, in subsequent generations from the Holocaust, what resilience looks like epigenetically.

I'm absolutely convinced, Alex, that the wisdom that we acquire with our life journey and the lessons that we learn have to be biologically embedded. It has to be sitting in influencing gene expression as well. So stay tuned. It's a time of really exciting science going on, and I think we're going to uncover some wow stuff.

Alex Howard

Yes. The more we can understand the specifics of that mechanism, of how those experiences become embedded in our system, the more we can potentially buffer that or change that. That's super interesting.

[00:19:33] Dr Kara Fitzgerald

It's super interesting. And this goes, just going back to Dr Moshe Szyf thinking that we'll be able to engage in these diagnostics very early on so perhaps one would be spared a lifetime of therapy or treatment centers or a lifetime struggling with addictions, etc. We would actually be able to turn some of this stuff around very early on.

The possibility and the promise of it is amazing. But I also want to talk about what we know now and some of the things that we can do now as well. Do you want me to?

Alex Howard

Let's just very briefly, for folks that aren't aware of the study that you did, just talk about a few of the key principles and findings, and then from that we can jump into some of the specifics that people can do.

Dr Kara Fitzgerald

So we did a specific study using a diet and lifestyle program. So there was a very careful diet designed to influence DNA methylation. And we can talk about some of the specifics.

We had a basic simple exercise prescription. We had a twice daily modest meditation practice. We wanted people to sleep well, so we did brainstorming around sleep hygiene tips, etc. We gave them a probiotic and a greens powder, so just a polyphenol plant phytochemical concentrate. And that was the program.

We were given an unrestricted grant through Metagenics, a large international supplement company for professionals. And Brent Eck, the CEO, is a friend of mine. He and I had been dialogging about my thinking around epigenetics for a long time. We released our program in clinic practice before we were able to study it, studying epigenetic changes, as we did at the time. We started our study in 2018 and ended up finally published in 2021.

So it took a long time. And in 2018, these tools weren't available in clinic practice and they're only just barely available in a very limited way in clinic practice now. So we needed to do this in the research setting. And I'm just eternally grateful that Brent was as excited about the possibility of looking at gene expression and changing gene expression as I was. And so he funded this.

We ended up showing that our study population, the people who followed it, as compared to those that didn't, were able to become biologically younger.

So the way that we measure how fast our bodies are aging, it's not our chronological age. In fact, I think there's going to come a point in time when our chronological age really loses a lot of weight. It's not wildly important, in that we'll be paying attention to our biological age. That is how fast our body is aging. Chronological age, trips around the sun or birthdays we've celebrated, there's nothing we can do about that. But how fast we're actually aging, there's a lot that we have to say about that journey and we can wildly improve it, improve our lifespan and improve our health span.

The way that we measure biological aging is through DNA methylation, so going back to looking at these patterns of methyl groups on our genes. And our program over an 8 week period, changed DNA methylation patterns to a more useful pattern in our participants.

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So we basically, as compared to controls, turn back the hands of time in these guys by over 3 years. Amazing. It was a first of its kind study and it got a lot of attention and it actually ended up getting the book deal *Younger You*.

And we're doing more research now, so we're headlong into a new study. We're using new biological age clocks and so on and so forth. But it seemed to me to make a lot of sense to just launch this program to the world so everybody can do it if they are so inspired.

Alex Howard

One of the things I think is really cool about it is the things that you describe in terms of the interventions were all relatively simple changes. It wasn't like some really highly complicated supplement protocol or deep lab testing. It was what people at home that are watching can do.

So walk through some of those simple pieces that if you were talking to someone at a dinner party that said, "Kara, what are the three things that I can do that I don't need to see a practitioner, I don't need to go down a deep path?". And maybe in this particular context that person is suffering from anxiety. That's the presenting symptom, but ultimately they recognize that they want to be able to impact on their biological age.

Dr Kara Fitzgerald

Okay. I think it's fabulous. That's a great question.

So what are the easy, low hanging fruit things that we can do that will change gene expression? Not just that, it's good for you, but we can actually change gene expression towards being biologically younger. But also, biological age is the biggest risk factor for the chronic diseases of aging, cancer, cardiovascular disease, diabetes, dementia. We can reduce risk for those by reducing biological age.

And anxiety, if we get anxiety in there, it can promote bio age and can promote these chronic diseases. So everything is interconnected. So if this person is presenting with anxiety, if that's what they tell me about at the dinner party. And it's amazing what people will tell a physician wherever you are.

Alex Howard

You and I have both been there.

Dr Kara Fitzgerald

Wherever you are. I remember, I think I was at Heathrow or something and the otherwise pretty conservative customs officer talked to me about the litany of medications he was on and didn't let me go until I had satisfied.

Alex Howard

It's very funny. My wife and I were going to a friend's birthday a few weeks ago, meeting a bunch of new people. We were walking in and I said, can we just say that I'm an accountant tonight? Because

what always happens is I sit next to someone, and I don't mind, ultimately, but of course, it's then... So you and I have both been at that dinner party and the person next to us has gone, "I've got anxiety".

[00:26:16] Dr Kara Fitzgerald

Oh my God, it's a riot. Of course I'm talking to somebody about anxiety. Of course.

So the first thing is tending to that anxiety, tending to that anxiety. So as I was talking about before, really giving yourself a pass that things make you anxious and allowing it. I think there's a lot of shame around anxiety and judgment, which is only going to perpetuate the experience. So you want to really work on some self-love there.

But also, I cannot say enough, that things that will turn the volume down on sympathetic overdrive, so turn the volume down on that type A stressed anxiety personality type, will influence gene expression favorably. So by dealing with your anxiety, you're going to improve your biological age.

Meditation has good science. So as I mentioned before, one meditation event, you can stink at meditating, but one meditation event showed favorable changes. People who do it who become practiced meditators. You don't have to move to the mountain, you don't have to move to the Zen Center, but just engage in some basic, modest practice. They are biologically younger. They have reduced incidence of chronic diseases.

And, of course, it's the tool with well recognized evidence at managing anxiety. So meditation, yoga, Tai Chi, all of these things. Exercise. Same thing with exercise. One exercise event can favorably change gene expression. And exercise habits can make you biologically younger. You can actually hand down some of those exercise habits to offspring if you're preconception. It's so extraordinary.

This meditation habit could potentially be handed down as a resilience pattern to offspring. So I want us to understand that this isn't just good for us. This kind of engagement can change gene expression over the long haul. And if we're going to have a family, we can actually change the patterns that maybe we see in prior generations. We can get in there and really make a difference.

And we haven't even gotten to food, which arguably is one of the heaviest and most influential pieces of influencing gene expression.

So exercise, some sort of a stress reduction habit that we're consistent with, and then eating for, what we call epi-nutrients or gene whispering foods. It's methylation, carbon and three hydrogens, there's a methylation cycle that makes these methyl groups, and we want that whirring, we want it to be able to be producing lots of methyl groups effectively.

Nutrients involved include B12. So this is one of the reasons why we need adequate B12. Folate, something called betaine, which is found in beets. Choline, which is in high quantity in eggs or in mushrooms or in liver. Leafy greens, seeds, so pumpkin seeds, sunflower seeds. Even good fat, like in cold water salmon can influence what's happening at the methylation cycle.

So we want lots of foods to help methylation. And then there's a whole category of plant phytochemicals that seem to direct where these methyl groups go. So we don't want to turn off the gene that we want on. We want our methyl groups to be patterned on our DNA for optimal health and wellness, optimal longevity, optimal resilience. And these phytochemicals seem to help do that.

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And that would include these things that you know and that your listeners are already using in their life. Turmeric, so if you love a good curry. Curcumin, which is the main phytochemical in turmeric. EGCG or all of the catechins in green tea or oolong tea, even black tea has some good compounds. And I know you guys on the other side of the pond love your black tea.

Even coffee, actually. You love tea. There's plenty of coffee over there, too. Coffee is actually fair game for healthy gene expression, although I would argue that you want to turn over to some green tea as well.

Luteolin, quercetin, resveratrol, sulforaphane, diazomethane, these are compounds found in many different veggies and fruits.

In the book, I put together a 30 page epi-nutrient appendix. So these are the phytochemicals and the foods they're found in. So even the most finicky eater could go into this appendix and identify loads of nutrients that they're already eating and identify additional nutrients that they could add into their diet pretty simply. So there's much that we can do.

The study diet, I want to add, is low glycemic. We did a modest time restricted eating structure. So 12 hours on, 12 hours off. No dairy, no grain and no legumes, just in this 8 week portion. After that, if people want to transition back to consuming some of those foods in health hold quantities, they can. But in our actual 8 week component, we wanted to control sugar.

So sugar is, the standard American diet is a great example of what not to do for gene expression. You don't want a lot of processed foods, you don't want a lot of sugar, etc. All of these things have evidence as damaging the epigenome, damaging gene expression.

So let me stop there again and see if you have any questions.

Alex Howard

I want to track back to something we said earlier, particularly in the context of anxiety, which I think is really important. Because sometimes, as we were saying earlier, people recognize the impacts of these different things, and they then, in a sense, the more they understand how childhood experiences, in utero experiences, genetic heritage, how that's affecting them, it's actually more to be anxious about. It's more to be, oh my God, I have these things and I can't change them.

I want to go back to something you said. In an 8 week study, people's biological age changed by 3 years. So anyone that's watching this that has health anxiety or anxiety about previous impacts upon their body, what you're really saying is that some relatively simple changes can fundamentally transform those negative effects.

Dr Kara Fitzgerald

Yes, that's right. And we're just at the beginning. This was the first of its kind study, amazingly enough. It's pretty extraordinary. And I actually look forward to just really turning the bulk of my career attention towards continuing to answer these questions because I think the possibility of our initial finding is so extraordinary.

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So when we say your genes are not your destiny, I mean, we really mean it. And you are absolutely right, Alex. It looks like we can change things relatively quickly. It's absolutely extraordinary.

Alex Howard

One of the things that's also interesting, I really like the way that you design the study, that you went, what are the low hanging fruits in terms of food, in terms of supplements, in terms of lifestyle, in terms of sleep, in terms of meditation, mindfulness?

Dr Kara Fitzgerald

Yes.

Alex Howard

I guess one of the things that will be really interesting in the future is to try and figure out which of those things are having the biggest impact. There's obviously a combined impact where, in a sense, probably the sum of those things together is greater than the parts on their own.

But do you have any initial sense, if you were to design a study and go right, we can only do one, or we can only do two or three of those things, which would be the ones that you would pick?

Dr Kara Fitzgerald

So I guess, just because of my training, I'm thinking diet is obviously doing a heavy lift. What we're taking out and what we're adding in. Both, in that little time restricted window.

So I think diet is exquisitely important, but exercises as well. And we can see exercise influences mitochondrial DNA methylation, resistance training, and we see the heritability.

There was a paper that just came out recently suggesting that the influence of exercise is wrought via DNA methylation changes via epigenetic changes. So these authors were arguing that all of the benefits of exercise can be sourced to the epigenome, which I thought was really rather extraordinary, and can be passed on.

In fact, exercise can turn on, so tumor suppressor genes keep us free of cancer. These genes, as we age, or if we actually have cancer, the cancer microenvironment will shut these tumors suppressor genes off. As we age we start to shut these genes off. It's just like a raw deal. Aging increases our risk for all of the chronic diseases. And when you look at gene expression, you will see that gene expression patterns in an aging individual look like some of the chronic disease patterns. It's crazy.

But going back to exercise, exercise very effectively turns back on these genes. Phytochemicals do the same thing. So exercise acts at the level of the epigenome like a vegetable. If you don't want your greens, get outside on your bike or something. It's really cool and amazing to me.

Meditation, so the clock that we used in our study, a full 25% of it is influenced by glucocorticoids. So the genes they have, what they call glucocorticoid response elements, these genes might be associated with inflammation, maybe metabolic changes, pro aging phenomena. And glucocorticoids turn these genes on.

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So to me, 25% of the clock is influenced by cortisol is nuts. There's no other variable influencing this particular clock, to my knowledge, as much. That suggests that stress is a massive player in the aging process. To me, that's my take home on that.

So what does that mean? When you look at each component, it's hard for me to say now, I would say the majority of us, just having talked to a lot of my colleagues, would say that it's diet, but not at all. Definitely, I think David Perlmutter was pretty convinced that it was the meditation component, like turning the volume down on stress, and he has a good argument for it.

I would love it if I had my own laboratory and it was funded by the National Institutes of Health, and I could really design studies and test them out, it would be, of course, fun to control the various variables. But since I don't have that luxury, we continue to research within the app, as you mentioned before, the 3YY app. We have approval to continue to study it and we're studying it as the full multimodal program.

So stay tuned for more papers. But that's what I get to do right now to look at it as an overall program. I think that we'll be able to tease certain things out over time, and with enough people participating in the app so we'll see what we're going to be able to tell. But it's a pretty exciting journey.

Alex Howard

It is. It's super exciting. And I think also you and I very much share the same perspective that you've got to come at things from multi angles. Which is why with these conferences I love the fact we go deep in functional medicine but we look at the mind body, we look at how do we understand psycho educational elements? All of those pieces ultimately are important.

Kara, I'm mindful that we're running out of time. For people that want to find out more about you, particularly the new book, but also your work, where's the best place to go and what's some of what they can find?

Dr Kara Fitzgerald

So specifically about the book and the app, youngeryouprogram.com. In fact, we actually have a biological age self assessment there so you can plug in, you answer a handful of questions and then we'll spit out a report to you that will give you your biological age.

You can look at your answers, see the ones that you're doing awesome in, see the ones that you can improve. So that's at youngeryouprogram.com

If you want to find me and my podcast and blog and my clinic, etc, that's at drkarafitzgerald.com.

Alex Howard

Awesome. Kara, thank you so much. I always enjoy our time together and I really encourage people to check out your new book.

Dr Kara Fitzgerald

Thanks, Alex. It was great to talk to you.

[00:39:31] Alex Howard

Thank you.