

Harvard - Interviews - John Ratey

Jonathan: John, you had mentioned that one of the areas you are most excited about in your long and prolific career now that is emerging is the gut and its impact on lifestyle quality, diabetes and obesity. Can you chat about what lights you up?

John: Yup yup. I'm really excited these days about the microbiome and how important we've discovered, how this has an effect on every part of our body and our brain. The microbiome is a collection of bacteria, our bodies flora if you will, that we've accumulated over time through interaction with the environment. And this has a tremendous impact on our body health, brain health and where it's going to be found out is how this impacts our mental health as well as our cognitive health. And we already know so much about that. For instance, if you change a microbiome in someone who has Parkinson's disease they can lose their symptoms. In other words, it can be repaired at least in mice at Cal Tech. Which is to me that just blows my mind.

Jonathan: That's amazing. The gut has been referred to by some people as the second brain [right] as one of the top ranked doctors in the world, why is that?

John: Yeah, the gut has been referred to by many people as the second brain because it has more neurotransmitters coming from the gut than from our brains, especially serotonin and especially other factors that we haven't even identified yet that have an effect on our brain.

Jonathan: How does the quality of food that enters our stomach impact our gut in a way that permeate up to our brain and affect diabetes and obesity?

John: I think we're beginning to understand that the kind of quality food that we have is important for our gut and thus, then have an impact on our body health and then in our brain. We know that sugar and high glucose containing foods has tremendous impact on our microbiomes which then send signals to all parts of the body, all parts of the brain that probably indirectly lead to an increase in inflammation which is now the buzz word in health. We are fighting against inflammation in general and especially in the brain, and we're not talking about going after a cut or an injury but we're talking about this chronic state of inflammation. And our gut and our diet are really important there.

And we see sugar as a major toxin that increases our inflammation all over our body and we're not in balance and our body responds better especially our brains.

Jonathan: When you talk about inflammation. How would you describe inflammation generally, to a fifth grader, and then let's talk about what an inflamed...how can that be in your brain?

John: Yeah well inflammation is basically the body's response to an insult, to an effect from outside that's coming after us and our bodies response is to set up our defense to say OK we need to call the janitorial service and so we need to get our antibodies and our big cells to come in, T cells to come in, and chew it up so we eliminate the invaders. And what we really are concerned about is not just about that but that the chronic inflammation that happens and it's a little different than having a sore or a cut or a bee sting or a mosquito bite. It's inflammation that's always present. And this we know has a tremendous effect on brain health. One of the major investigation areas today is looking at how are we going to help the Alzheimer crisis that we're in the middle of. And one of the targets is to live right eat right sleep right exercise right but all to lower our brain inflammation no longer just looking at amyloid and plaques and tangles neural tangles but also looking primarily looking at decreasing our brain inflammation because when we get inflamed we get all of our defenders up in arms and this is when we start to have breakdown of cells. In my area and in the brain especially it is so key and important.

Jonathan: John, there's a tremendous percent of our population that is very concerned with neurological inflammation, cognitive decline. How big of an issue is Alzheimer's. What is its relationship to our lifestyle choices?

John: One of the things that struck me over the years talking about health and being healthy and using exercise is what grabs people's attention. They're not concerned that much with the cardiovascular effect, lowering of blood pressure, making your heart healthy although they are but then they know that we have drugs they're not even concerned about being overweight and having diabetes because we got better drugs, good drugs. Well what they are concerned about is losing their minds that is ageing because everybody knows somebody in their life who is aged out and has lost their connection with the world or losing it and people are very afraid of that and that is one of the things that that grabs people to say look if you don't live healthily you are going to

lose your mind. And you know one of the promoters of exercise way back in the 80s was a big study looking at what were the factors that prevented the onset of cognitive decline and Alzheimer's disease and they were three one was ideal weight. Second was continuous learning (i.e., Sudoku). Three was exercise and this was amazing. So, one of the authors of the study went back to his lab at UC Irvine and checked this out and thus broke, what I call, the scientific revolution of exercising the brain. And because he said hey what does exercise do for the brain. And that's when we learn that exercise actually makes our brain grow keeps it from deteriorating. And even today in all the Alzheimer protocols or anti-Alzheimer protocols exercise is number one, sleep, diet, ideal weight is still there because we know that obesity is correlated with a rapid, more rapid decline in cognition as we age and leading to Alzheimer's disease. In fact, there are some Alzheimer's centers now 15-20 years ago that were saying that a good way to describe Alzheimer's disease is diabetes Type 3.

Jonathan: Diabetes type 3, that is shocking. And you mentioned you can make your brain grow? Can we talk about, is that literally happening and if so how?

John: Yeah. Well we. We really do make our brain grow. That was the initial study and that has now been confirmed. A tsunami of studies can't even begin to tell you how many studies come out every month on looking at exercise and its effect on the brain because it has such a powerful effect. Most of our brain in fact is constructed to help us move, to help us move right. And as we evolved we added on more and more cells to help us be better and better movers. And, then we co-opt these cells to think with and to talk with and interact and to socialize with and thus we have the human brain. So, when we move we're actually activating the same brain cells that we've added on over time to think with and so when we activate those cells we make them tougher. And we make them stronger we make them more resilient. So, when that happens it guards against the ravages of time and stress which is constant in our lives.

Jonathan: So, it sounds like you just said You could imagine someone sitting in a calculus class and we would all maybe be able to wrap our heads around. I could see how studying calculus will sort of enhance what's going on up here. It sounds like exercise. The impact of studying calculus and moving your body are more similar than we thought.

John: Yeah, most people think that working hard at a problem or writing a paper and always really going to stimulate the brain and demand a lot from their brain...challenge your brain, and it does. However, exercise challenges more parts of our brain and does more stuff to sending up signals from our body as well as our brain to promote what we call the neuroplasticity. And the more plastic our brain is the quicker we learn. Also, there's neurogenesis birth of brand new brain cells which we learned in 1999 and as part of this revolution that started everybody wanted to know how come the mice brains were heavier after they were running in running wheels. Well a big area that grew in 10 days was their hippocampus or an inner part of the brain that has to do with memory and learning. And we now know that we grow new brain cells there. And when we exercise we activate the change from our stem cells which we happily have in our brain into new nerve cells.

Jonathan: What are some of the key mechanisms, I've heard terms like brain derived growth factor IGF 1. What are those what do they do and what do we do to get more of them?

John: Right, well and so what we've also learned over the course of these past 25 years in neuroscience and exercise is that exercise promotes the concentration of various growth factors and the one that's Queen of the May is brain derived neurotrophic factor or BDNF. And we know that exercise increases BDNF more than any other human activity. Why. Well we make more BDNF when we use our brain cells or individual brain cells. And when we exercise we use more brain cells than in any other human activity. So, we're making more BDNF all the time. As well, we make from our body sending up little bits of stuff from little bits of proteins like IGF 1, FGF 2, VEGF. These are just names and what do they do? They repair. They help to repair our bodies. If we're moving, we are breaking down muscle fibers we're challenging our bones, we're challenging our organs. And we send up repair surge to help deal with this in our body, but that also goes up to the brain and helps guide our brain to do its job which is to change and makes our brain more plastic. And that's what we really are after making our brain as plastic as we can be so the 90 billion to 100 billion brain cells we have are more ready to grow. In the way we learn is if we grow the information and that is if we change the actual configuration of our nerve cells we make more neurotransmitter we make more receptors. And providing the appropriate environment for this is really really important. And exercise provides the healthiest environment for our brain cells to grow.

Jonathan: So, John, you mentioned exercise, but you also mention stress reduction, sleep, high quality eating, so high quality movement, high quality eating, stress reduction, high quality sleep. It seems like we mentioned all four of those things impact the brain. All four of those things impact the gut, all four of those things impact hormones, all four of those things impact obesity, all four of those things impact type 2 diabetes they impact type 3 diabetes/Alzheimer's. If the same things cause a low quality. All those things the same things help to reverse those things high quality I mean...it's...obesity is called the one thing, diabetes is called one thing, Alzheimer's is called another thing. But it seems that they have so much in common from a cause and solution perspective. Can you just...

John: Yeah one thing that's changed in our way of thinking about disease in general and in medicine, or is, changing is looking at things from many different inputs many different primary causes. There's not one there's not one problem, there's many. And this is why healthy living makes so much sense, reading, eating quality foods, exercise, sleep, being present in the environment. Being outside in nature and something that is really coming into the fore now is being connected. Being social and having connection in fact connection may be the most important factor in long term health for the body and for the brain. Just as exercise is important, it may in one study shows a big study looking at Medicare B, that the more socially we are the better you are the less likely you're going to be using Medicare B, three times more impactful than exercise if you start and stay with it which is amazing to me. But that's five times more effective than if you take your medicine as your doctor prescribe for you. So, it's really a big factor in brain health. And by the way that helps reduce our BMI, our weight reduce obesity and certainly reduce cognitive decline in Alzheimer's disease.

Jonathan: Just let me see if I got that correct. Did you just say something along the lines of, 'if you were to compare taking medication with having loving relationships with people versus meds that love is five times more powerful in terms of brain gut hormone overall health?

John: Yeah, yeah, this is a stunner for me too and I when I learned about it but because there are actual numbers looking at the big data analysis out of Silicon Valley that looked at Medicare B and said look what are the factors that keep you from using

Medicare B, looking at 3 million people over a five-year period. And what did they find, they found that if you took your medicine as your doctor prescribed you got a positive score of 12. If you began to exercise and stayed with it, you got a positive score of 24. If you lost weight for any reason you got a positive score of 20. If you got more social and you stayed more social, you got a positive score of 63. So, it blew me away. And I'm now partnering with a group out of Stanford that's looking at ways of increasing our socialization especially amongst the elderly because the problem is that when we as we age people tend to cocoon they tend to pull back. And this leads to what this leads to putting on more weight for one thing and so then you have the sequelae of diabetes Type 2 etc...

Jonathan: So, there's a there's a song I'm sure you're familiar with that has been mantra. All you need is love. Were they predicting the future? Is it the scientific revolution?

John: I... that's true. Yeah. It is not just about love, it's the kind of love we think and the ideal relationship, but it's being connected to people, being involved, joining groups being you know that's why one of the incredible things we see in the exercise world is the group phenomena and cross fit and soul cycle and all that, now the Peloton you know, you have your group on your screen that you're involved with and people really, it captures them and makes them come back to Zumba groups that you know people wouldn't miss for the world. That's important to them. And it's important that they go and participate the whole yoga almost with nine percent of Americans this week will go to a yoga class. That's incredible. Why. Because they're part of a group phenomenon is one thing but also, they see what it does for their mood in their body and oh by the way this leads to decreasing insulin, decreasing glucose levels decreasing the impact of diabetes.

Jonathan: Sure, you get asked this all the time for people talk about this they'll say I have a diabetes diagnosis what do I do about that or I'm trying to lose weight, what do I do about that or I don't want to lose my mind I don't want to get Alzheimer's, what do I do about that. But it seems like the answer to all of those questions is the same, on some level.

John: Yes, that's right. What one of the things we're learning is that fantasy grandmother told us that is eat right go outside exercise play very vigorously have a bunch of friends and go to sleep when you're told and get a good night's sleep. Those are the key factors that now scientifically, we are seeing as health promoting as weight reducing as diabetes reducing as the recommendations by everyone in medicine we're coming back to that, although, we're so dominated by the quick hit Newtonian fix that is there's a disease, there's a problem, there's something that we need to attack with the drug bam we send in the guided missile and solved the problem. However, if you are paying attention to your body's systems and you get them working right for you that will lead to the best outcome.

Jonathan: So, it seems like almost as simple as high-quality living generates high quality health universally.

John: Yeah yeah. No it's just that look that the healthier we are the more we and by that I mean the more we pay attention to keeping ourselves as fit as we can be which includes all the things that we mention eating right, exercise, sleeping correctly and enough, which is a big problem in the U.S. and around the world it's a big problem, and being present when meditation but also being in the moment as well as exercise and being in nature enough, and focusing on our social involvement. This is why one of the things that people are told when they retire or are coming up for retirement they're told don't retire you're just going to erode and a lot of people do. Unless you have a plan to travel and the means to do that or to keep yourself engaged in an activity people tend to cocoon especially with our digital world that we have today which is so seductive and so addictive and this leads to our biggest problem in medicine which is being sedentary where you know the mantra that we say in public health is 'sitting is the new smoking' and that works to alert people that the more we're up and moving about, the more we'll get out of life and the less problems we'll have with our health.

Jonathan: That's extremely powerful. When we see that the system is all connected, when we see that having relationships, exercising, moving with quality, sleeping with the right quality and quantity, quality in having relationships. What would you say...so many Americans around the world believe that they just need to eat less, just like, you're stupid and weak and you lack willpower and if you would just eat less food...that would solve the problem.

John: Yeah, the diet lobby and the diet addiction that everyone's into to lose weight is one thing. And you know they if you round it out with everything else with eating good quality food with doing all the other things that we've been talking about exercise, sleep, socialization that you your weight will come off, it will come off and your threat of diabetes will drop. You know when I was in medical school, it's a long time ago...when we had a patient who came in with diabetes type 2 we wanted to follow them because there weren't that many of them and there certainly was no kid ever that had diabetes type 2. In fact, there weren't that many overweight kids or obese kids. There was occasional but very very seldom. Now that's one of the biggest problems in the schools for the school nurses is managing their diabetes medicine for their students. It's incredible.

Jonathan: I don't think people understand that so many people feel that being overweight and diabetic and then eventually losing their minds is inevitable. That that's just what happens with people nowadays. Right? That's just the way it is. Can you please illustrate for us how in your lifetime the incidence of obesity diabetes has changed?

John: Yes, in my lifetime and as a practitioner and as a living person and observer of life Diabetes has increased hugely. Ugely, as our president likes to say. The look of our population has changed and is changing throughout the world now we're spreading our phenomena the fast food phenomena everywhere and what we're seeing is an incredible increase in diabetes. So, people were getting overweight and diabetes is becoming a major problem in the world. I did a lot of work in China. Still, I still am, and it's become one of their biggest problems is kids especially being overweight and diabetes. And both kids and adults it's overwhelming their medical budget. And as it is it is ours and it's just bound to get worse. As our quick fixes for food is right there in front of us. And the sad news is is that this impacts our less wealthy population quicker and because they're eating the prepared food all the time they don't have time nor the funds to eat right, to eat more vegetables to eat less processed food, less fried food. It's often part of their culture to do that but to eat that way, but they could do it healthily. And one doesn't have to just soak it in and carbs and fat and to put on the pounds and we see this in the indigent areas where people don't have the funds or the means, or knowledge that this is something that's a lifelong process for them.

Jonathan: Can you trace me through...it seems like there's a super tight relationship between overweight, obesity then diabetes comes in then you lose your mind and it starts off as just a few pounds it's not a big deal it's fine. But like what, what, what is going to happen to these 7-year olds who are overweight now? They're 7! What's going to happen over the course of their lifetime?

John: Well when we look at the tragedy that is are our kids that are overweight that are overweight a little bit and then they're going to get a little more overweight and what happens, their self-esteem drops because they don't have the right body shape. Thankfully that's changing a little bit because everybody is sort of overweight and even then, even amongst the kids. And if you're not an athlete you know you're worried about that kind of thing. So, but this leads to, poor self-image and the poor self-image one of the ways we assuage the feelings of not being rewarded with all the glories of being cool or being part of the crowd. Is we eat and because it's a quick fix and people get into that. And certainly, when we're sitting all the time playing video games or watching TV or watching Netflix I mean what are we doing. We're usually consuming very poor-quality food and that leads to even more weight and even less self-esteem, and then that leads to diabetes and depression. And then eventually leads to a quicker decline in our cognitive apparatus in our brains and eventually into Alzheimer's disease.

Jonathan: And so, in some ways it sounds like early in life you lose it when we think of childhood, right. What is childhood supposed to be? You're supposed to be playing your supposed to be with friends so that that gets stripped away from you. You lose that then you go into isolation then you become diabetic and now you have to spend your time injecting insulin, so you lose the beginning of your life you lose the middle of your life and then you lose your mind. People are literally mortgaging their entire lives. You work with people who suffer so profoundly from this.

John: The ravages of not paying attention to your health. Do you know how much you weigh; how much you consume and how you manage that part of your life is incredible. When you when it gets out of control then you have this self-image because you feel like well I can't play sports, or I can't exercise I'm overweight. I'll hurt my knees or ankles or whatever. So, they never start. And it keeps them from it. And then it leads to gradual deterioration and all the while we see an increase in inflammation that's silent but is

there an eating away at our good stuff our bodies and our brains. You know taxing them in a different way than exercise or learning or involvement taxes our brain and because this constant never stops. Never stops.

Unknown: You talk to Jonathan as if he were someone who has a lot of strikes against him right now. He's overweight he has diabetes, he doesn't go out he doesn't spend any time with friends. He doesn't have any of those things that we're talking about. Can you speak to him as if he didn't understand anything else but pills? Where do you even start and in just a very person to person imploring sort of manner.

Jonathan: I'm diabese and I just want more meds.

John: Yeah. This is what I would say to a person who has diabetes and is allowing themselves to disintegrate or implode or explode you know sort of hard to know. Well look you have the opportunity to change. You have the opportunity to affect your future. And one of the things that I recommend is starting to move literally starting to move. Because as you stay sedentary you stay in the chair. And this leads to you're feeling bad not feeling empowered not feeling vigorous. But if you start moving it's like taking a little bit of Prozac and a little bit of Ritalin. So that it helps you improve your mood improve your self-esteem improve your focus improve your arousal and eventually improve your energy so that your then more interested and capable of doing things in your life that you might want to do. This then leads to your being more interested focused on making your body your friend rather than a sack you're carrying around with you, then that happens you're and you're in the driver's seat.

Jonathan: So many people feel like their body is fighting against them and they're in a fight with their body. But it seems pretty clear that if you give your body high quality inputs high quality relationships your body will work for you can grow your brain. Can you talk about just the kind of concept to set-point and how low-quality inputs do sort of program your brain, gut and hormones to like inflammation? The body is working against you and if you change the quality of your inputs you can change your set point then your body will work for you.

John: As we grow in life we change what our body is expecting from us it's called the setpoint. We have it for weight. We all hear, well that's my point I can't do anything

about it. I'm obese or overweight and I'm always going to come back to this certain weight or this set point. That's not true. You can go below the set point and stay there. And the longer you stay there your set point drops you know and we know that this is a fact. In the same way with exercise though I can only do so much exercise. Well that's not true. You can always push yourself to do more. And when you feel more capable you will push yourself to do more. And when you see it when you start to lose pounds and weight and start to see your glucose levels drop that will be an incentive for you to continue that. With a better diet, more exercise increase socialization better sleep all those things will happen.

Jonathan: So, it sounds like a virtuous cycle almost because so you got to that point that's up here. You kind of you do need to use willpower for a temporary period of time. But if you stay below it it resets and that motivates you and you it does it. So is there this sort of virtuous cycle.

John: I like the way you said that, virtuous cycle. It's an upward spiral rather than a downward spiral that you get into. Once you get on a healthy train once you get on exercise once you get on the right kind of diet once you start seeing the changes. And it's important that you don't expect things happening overnight. One of the problems, for instance with exercise and diet changes is that people want to see changes immediately. Well, with exercise now the University of Michigan has shown this over 15 years now that the way to keep people exercising is not to focus on the long term but on today. How you feel today and what exercise does for you today and then it will be one day at a time, one day at a time in the same way with changing your diet once you begin to say OK I don't need to eat all this starch all the sugar all this processed food. But I can go to a healthier Mediterranean diet or whatever the hottest fads are today, that you learned to expect that you learn to need that. So, what we're talking about here is that people need to get started and look for the changes that day. How they feel differently. And don't expect that they're going to lose all this weight or get that all this fitness, tomorrow or in two weeks but that it's focus on the long term, and its progress over time. And that not to look for the perfect answer to everything. It's in the middle of moving of being on a healthy train you will feel so much better so much more alive so much more involved. And this is really what everybody wants.

Jonathan: We talked, you mentioned briefly, the Mediterranean diet or whatever the sort of diet du jour is, but it does seem, and you cover this very well in your books, that there are common denominators in terms of what is determining, cause with movement of course you could do it but really just freakin' move at this point, but with eating a lot of people get confused. But there are some things it seems like you know about food quality for example processors and non-processors, you've covered that already. But in your experience calorie for calorie, have you found that some foods are more satisfying and then less prone to be over-eaten than others?

John: Well today of course with the food choices that we have I think that the information that we're gaining is that the more we have a balanced meal the more we have enough fat and protein in our diet as opposed to carbs because we'll get plenty of carbs if we eat enough vegetables, but that fat for instance sustains us helps us get the kind of calories we need to use throughout the day and also reduces our cravings for more and more and more. The irony is the fat phobia that we got into in the 80s or was it the 60s, that this has led to the glut of carbohydrate and fast processed food that we see everywhere. And I think it's interesting to see what's happening with the commercials these days on TV. Everyone's talking about less carbs the beers with less carbohydrate, the diet drinks, not so sure they're so great but it's like avoiding the high sugar content is the way to go in terms of what people are advertising so when it hits that level of interest...saying well OK this is going to impact most of our viewers or a greater percentage or viewers you know people are getting sensitized to it but not enough people are sensitized to it and not enough people take it to heart.

Jonathan: How close are we to saying that eating sugar and starch will make you lose your mind.

John: What we know is that when you look at the Anti-Aging Protocols number one is always exercise. But number two, thereabouts is diet and in their diet recommendations they talk about getting rid of the sugar and starches that are so prominent in the American diet and now the diets around the world. Because it causes us to put those sugar calories, excess sugar calories that we take in into fat which then leads to problems with inflammation, and eventually seeing a decrease in brain health. So that I think that this is getting out there and people are aware of this that the way to deal with Alzheimer's is prevent it. And one of the big preventions is to eat one of the diets that

deemphasize certainly processed foods but even high starch containing foods and high sugar. So, whether it's the paleo diet or the Mediterranean Diet or the Okinawa diet I mean those really focus on having more fat and protein available to use as a food source and it will lead to less cravings. Because when you know what happens with sugars and starch after a meal you get an increase of insulin and takes away the glucose from the bloodstream and then soon you're going to be craving because if it goes away in about an hour an hour and a half and then you're saying why am I so hungry all of a sudden, I just had a great spaghetti meal. You know if you didn't have enough meat in it probably you're probably going to be a bit in withdrawal.

Jonathan: You mentioned common diet, paleo, Mediterranean, it seems like high quality eating is pretty universal you got non-starchy vegetable, nutritious proteins, whole foods fats and the lower sugar fruits out there. What do you think about that as a template?

John: No, as far as diet goes to have a diet like the Mediterranean diet I mean that's what everyone's pushing these days in medicine. I think that's a smart choice for people because it really keeps us away from high glucose containing fruits and vegetables as well as starches which are power packed bundles of glucose. Now we don't think most people don't think that a strand of spaghetti is sugar but that's what it is. Your body quickly breaks it down. And the wholegrain people even though that's a better choice perhaps because it takes a little longer to break into glucose, it's still broken into glucose and you still get maybe not a quick a spike, but you still get a lot of glucose in your system.

Jonathan: So instead of using a term like the Mediterranean diet try to keep it agnostic if possible. So non-starchy vegetables, nutrient dense protein, whole food fats, low sugar fruits... do you like those four food groups do you feel like those are the kind of food...what do we eat? What do you eat. What would you recommend. I'm your patient, what should I put on my plate.

John: OK. The first thing I would say to a patient when they ask me about their diet I say get rid of everything white except cauliflower in your diet because white usually signifies starch or sugar. So, what you eat are vegetables that don't contain high concentration of sugar, fruits that are less sugary and certainly leafy vegetables which

don't have sugar in them, but they do get broken down into carbohydrates which we need, and meat and fat. You know the big thing is there's a book coming out Fat is my Food. You know and why are they just being, contrary, no they are pushing the science of that we now see fat as our friends. But the right kind of fat. I work with the people that deal with the omega 3s for years and in psychiatry we know for instance omega 3s can help reduce mood problems reduce our depression reduce. The first study was done here in Boston looking at it as an omega 3s in fish oil to be used to treat manics people in acute mania. That's how it started in psychiatry in 1990. And we found that it was as good as our drug lithium to treat mania. Well this opened the door to using Omega 3s as treatment for all kinds of ailments because we've farmed the omega 3s out of our food stock. And you know everybody says eat all that salmon and everything, but salmon is not the best thing in the world for you, farmed salmon, fresh farmed salmon isn't because a lot of toxins that are there. So, you have to be careful what you say. But the Omega 3s are very useful not just for building our brains but also for helping our brains control themselves control us so that we use supplements of omega 3s for mood problems for attention deficit disorder for anxiety problems. And certainly, it's on the list of those food supplements that the anti-aging people are wild about.

Jonathan: Food is medicine literally in that context. Not figuratively you actually prescribe omega 3s to patients.

John: Yes. Yeah. No, I had to make it clear. I actually tell patients to get on their omegas 3s, I have certain ones that have higher EPA to DHEA because I found that to be much more useful. And the NIH is using them now in their Omega 3 studies so it's something to pay attention to. But usually because usually if your using a high concentration of EPA omega 3s you will get plenty of DHEA which is a building block in the brain. And we need it

Jonathan: Have you seen impacts on inflammation in the hypothalamus?

John: I'd rather talk, when you talk about the hypothalamus, the controller for the hypothalamus is the hippocampus. And that's where exercise comes in, exercise now we're drilling down to see what kinds of new cells we make in neurogenesis when we exercise. Well they happen to be GABA cells and GABA is a big break in the brain that's our inhibitory neurotransmitter in Elizabeth Gould from Princeton who wrote the story

on, helped break the story in 1999 on the fact that we make new brain cells has shown that in our hippocampus a good portion of the new cells we make are GABA containing cells. What does that mean. That means when we've experienced that threat from the environment whether it's in our minds or in reality. We are setting ourselves up to turn on the stress response. Well GABA works to blunt that. And so, it's going to take more of a threat to have us go into the fight or flight syndrome or turn on the hypothalamus and just regulate or sympathetic nerve parasympathetic nervous system and all the things that follow. So, we actually know that by exercising we make more of these GABA cells that help us withstand more stress.

Jonathan: So, exercise that's very powerful so exercise doesn't just in the moment help with stress reduction.

John: I mean there is an acute and chronic effect of exercise and exercise has an acute effect by liberating a lot of neurotransmitters and increasing levels of BDNF IGF 1, all these other great growth factors. But these have a chronic effect. We grow more brain. For one thing we would make better connections. We stabilize our 90 to 100 billion brain cells when we are exercising so chronically that is a chronic effect. And also, with stress it has an acute effect by lowering our stress level but by also and in many different ways by making it harder for us to get stressed. By changing the brain.

Jonathan: It seems like there was almost a set point for stress. Some people get stressed out about littlest things and then they go, and they go, and they meditate for four years they come back they seem like fundamentally changed. Is there a stress set point that you're changing here?

John: What we do when we when we know about when I mention about more GABA cells but even before that we know what we're doing with chronic exercise you are making it harder for the sympathetic nervous system to turn on. That is way before we go into fight or flight syndrome way before we get into the panic mode. We know that we change our response to threats from the environment by not getting our body ready to go and keeping us at peace. So yes, we have, if you want, a set point for our response to stress and as we build up our resistance to stress it takes more stress then to challenge our stress response. So, the best pieces that you can use to make the puzzle for a healthy lifestyle are exercise diet enough sleep being present in the moment,

getting outside and probably above all being connected and remaining connected to others.

Jonathan: What is the most shocking thing you have found in your research when it comes to exercise versus medication to treat depression and anxiety.

John: The shocking thing is that exercise in many cases is as good and last longer if one continues to take it than our antidepressants.