HRV and FDC podcast

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SPEAKERS

Dr. Mike T Nelson

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Dr. Mike T Nelson 00:01

Hey, what's going on? It's Dr. Mike J. Nelson here. And welcome back to the flex diet podcast. Thank you so much for listening. Really appreciate it. Today, I've got kind of a double episode so to speak, I'm going to be talking about heart rate variability, super short primer on what it is, and then how you can use it with the flex diet certification. And then after this, I've got a short kind of q&a session I did with Dr. Lonnie Lowery with some of his students actually did it live for his class this past year, on just some basic questions on heart rate variability, I wanted to just add that in here and share it with you. If you're listening to this, on the day it was released, which is Monday, July 26 2021. I've got a few hours left to get in on the flex diet cert for this round, go to flex the diet calm, FLE x dt.com. That'll have all the information there for you. You'll notice that it gives you also a discount if you buy the HRV education course and the flex diet cert. At the same time, I'll be talking about how those are related here. If you're listening to this podcast after that time, you can still go to the same website flex diet, calm, and you'll be able to get on to the waitlist there to be notified once it is open yet again, probably sometime this fall is what we're kind of targeting right now. And that also puts you on to the newsletter, where you get all sorts of great information and other things that I only share directly with the newsletter and it's free. So go to flex diet.com. If you're listening to this today, when it was released, you can still get in on the flex diet certification with the HRV course or just the flex diet by itself. And we'll hop right into it. So today we're talking about heart rate variability, and how this is related to kind of nutrition and some of the concepts that I

teach and the flextight certification course HRV for those who are listening, you're probably familiar with it stands for heart rate variability, that we can measure our resting heart rate. And that gives us some pretty good information. If you know what your resting heart rate is in the morning, that can be useful it is I would say associated with aerobic fitness. If you are not in the best aerobic cardiovascular condition, your resting heart rate in general will tend to be higher. As you get more conditioned or improve your cardiovascular performance. This will go down. Now again, there is some variation between people. I've seen some people who have really good aerobic cardiovascular performance, and they don't have an excessively low resting heart rate. Think it was rumored that Lance Armstrong has heart rate when he was competitive in the Tour de France was in like the upper 30s I think maybe even mid 30s. So pretty low. However, other cyclists on the tour, you know had heart rates in the 40s. But in general, the more aerobic cardiovascular condition you are in your resting heart rate will tend to be lower. So if you only know resting heart rate first thing in the morning, you would need some device to measure it. That can give you some information, and console's and stuff I do use that information. If I've got someone who we're looking at some performance goals, maybe they want to improve some rowing goals or other things maybe better across it performance potentially, I will ask them what their resting heart rate is. And if it's in, say, the high 60s, and they don't have any reason for that, right? They don't have any pathologies. And yeah, I'm thinking they probably want that to be lower. Now again, it isn't the bln doll. I'm still probably gonna have them do some type of Max vo to testing. So vo to the volume of oxygen you can run through your system at the maximum level and that'll give me some information. Ideally, though, I do want to know what is their heart rate variability. So heart rate variability is like the next layer down from resting heart rate. And how we get it is we look at the variation between one heartbeat to the next. So as you're sitting down resting, you're at a, what we call steady state. Most people believe that your heart should be like a metronome, that it should be very, very exact. Because you're at rest and you're not doing anything. It turns out if that is the case, that is not good, no bueno. You are losing, you have a lack of heart rate variability. So we actually want this fine scale variability, the heart rate should change just a little bit with each beat. So if we put a device on you to measure it super accurately, while we may see in a poor case of heart rate variability, 59.1 beats per minute 58.9 59.5 58.9, that it doesn't change very much from that average. If we have someone who has a better heart rate variability, more explain what that means, then it's going to be a little bit more variable at rest, they may start off at 59.1 and 57.8 60.0 58.7 59.7, it's going to vary a little bit around even possibly the same average. So this fine scale variability, heart rate variability is a marker for health. And I would argue potential performance. reason I put potential than there is because acute performance is a little bit different. But all things being equal. If you have a better heart rate variability, most likely you can handle more training volume. Therefore, you can have a requisite the capacity to do a high level of work to get the result that you

want. So heart rate variability I find is interesting and useful. What this is telling us when we look at how heart rate variability changes, it's telling us this stress on your autonomic nervous system, the autonomic nervous system has two branches, one is the parasympathetic, the rest and digest. The other one is the sympathetic, the kind of fight flight or freeze these stress side of your autonomic nervous system. Imagine it's like a brake pedal and a gas pedal, the para sympathetic side is the brake pedal, as I push down harder on the brake, the car is going to slow down, as I increase what's called vagal tone, sort of parasympathetic output, the heart rate will slow down, just like pushing on the brake, the car slows down by push on the gas, that is more the stress side of the equation, that is the sympathetic side. Yes, there is more stress on the engine acutely, but the car is going to go faster. As you increase sympathetic tone, heart rate, even the contraction property of the heart will get better. And this is a little bit more acute stress, but you're going to get more performance, you're going to get more blood through the heart and off to the rest of the body. So heart rate variability tells us this balance between parasympathetic and sympathetic at a high level, if you listen in kind of to the bonus, here, we go into a little bit more of the weeds on how you would calculate that and some more of the details. So HRV, the kind of what I call the golden rule of it is best case scenario, it will only tell you status of the autonomic nervous system at the point in time where you measure it, we usually want to measure after the most stable period of time, if we want to compare one day to the next day, chronically over time. So for most people, this is going to be first thing in the morning, a seated measurement way to you get to a steady state, maybe one or two minutes, and then hit start on whatever device you're using. I primarily use the iflight device. So instead of athlete it's I fleet. That's my favorite system right now. But I do have an aura ring that works. Okay, for aggregative HRV I like or a little bit better for sleep and some other metrics. So whatever you're doing, if it's not automatically collecting HRV, and evening, or I should say while you're sleeping like aura, then do it at a time period that can be repeated. So for most of the time, that's going to be first thing in the morning, usually seated for most people. If you have a really low resting heart rate, you may need to do it standing. So HRV will tell you the status of your autonomic nervous system at the time you measure. So that's really good in the past. I've done research on HRV, when I started this, oh man, almost 13 plus years ago, now, we had to bring people into the lab, we had to use some equipment that was about 10 grand, we had to collect the data, I had to write a friggin MATLAB program to do some monkey motion with it and entered into another program called kudos to get the data out. Wasn't horrible to do, but it was kind of a pain in the ass. And the equipment was expensive to do it. And you had to come into a lab in order to get readings. So trying to do this day in and day out to see changes in your nervous system. Not super practical. So doing that through your phone now for an app that's like less than $5, to me is still quite crazy. So we have our HRV, we have been doing it each day. So now we can see changes in stress from one day to the next. So to me, that's like super useful. I've used it with all my online clients.

Now going back, whew, probably coming up on over six years now. And that's using mostly the iPhone app. I've tested some other apps and they can be okay. Just make sure that the app has been verified, and it is accurate. Everybody in there, brother is trying to cram HRV and everything now, and I'm not a big fan of a lot of the other uses of it. Some of them are good, some of them not so good. So we have our HRV measurement. The downside is, it doesn't tell us exactly what may have resulted in your body being more stressed. So remember, as we lose fine scale variability, your body becomes more sympathetic. As we increase this fine scale variability, we become more para sympathetic. And like I mentioned, the downside is we don't know if you have a change in HRV, it is becoming more sympathetic more on the stress side. HRV by itself will not tell us why that is. So having some type of context indicators, or just good notes in a journal is super useful. Because over time, you can now go back and look. So in the eye fleet app, again, I'm not sponsored by them, I've just used their app for quite a while a shout out to Simon, the CEO, and everyone there has been super helpful. They have a way that you can just report on little slider scale, self report, how was your training? How was your nutrition? How was your energy etc. So when I go back and look at this with clients, right, because most of my client work is either in person testing here for just one off type stuff, or it's ongoing programming with clients online. Some of them I've never met in person before. So having that context is super useful. So if you look at, say, Bob's reading, and it says, ooh, while Bob has really been stressed the past three days, his HRV is starting to tank, right? He is losing fine scale variability, he is becoming more on the sympathetic side of the spectrum. The first thing I'm going to look at is the notes section and the context. So maybe he self reports I just sleep has been horrible the past three days. All right, that gives me a way to target specific questions to him. And we can try to work on what the next intervention would be. This brings me to the top three things that I believe HRV can be super useful, and where a lot of people tend to, to hose stuff up. Right. So I always like probably because I did a master's in mechanical engineering, thinking about things from a systems point of view. How would I know if something is going off of the rails? Again, we can look at performance, we can look at self report indicators, there's lots of things we can do. And I think there's a time and place for most of them. But here's the three things that I see people probably get in air, and how I think heart rate variability can catch or provide some awareness to them sooner. Number one, is people tend to be too aggressive cutting their calories when they're trying to increase fat loss or better body composition. Now, I understand there's been some very interesting studies that have been done on this. Dr. Bill Campbell did one recently where they purposely slashed calories very aggressively. There's been some other studies in the past that have looked at reducing calories by 40 to 60% overnight in relation to a low protein group, which is that point three five grams, and point seven grams per pound of bodyweight trying to put them in more of a higher stress. Have aggressive cut. One. And this is because we're not really sure what's going on. And two, we don't have an unlimited time to run studies. So a lot of the research is sometimes

more on the aggressive side for shorter studies with calorie reduction. However, this doesn't mean you should slashed your calories, like 60%. Overnight, right? In general, I see people are too aggressive cutting calories, too much too soon. And what you'll notice on heart rate variability, again, this is assuming all of their other stressors are the same, which they may or may not be. This is a form of a stressor, right, especially if you're trying to keep your steps the same and your output in the gym the same. Most people report that they feel less energy that don't feel as good. And what we'll see is that their HRV will start showing them to be more sympathetic, right, because you're asking your body to kind of do the same thing. With less fuel coming in. In general, there's going to be a cost to pay with that. So Mistake number one, I see people tend to aggressively cut calories too fast, too soon. And if you've got a good HRV baseline on that person or on yourself, and you start a, let's say, crazy weight reduction diet, and you plan to do this for a longer period of time. On Monday, you slashed your calories by let's say 40%, which again, is probably too aggressive, I would not recommend that. We can debate later if aggressive, short periods of time of calorie reduction may be useful or not different topic for a different day. But you do this again, Tuesday and Wednesday and Thursday, and we watched your HRV just start dropping lower and lower. I'd also look at your self report of energy, oh, you feel more tired, but you're sleeping around the same, your training has been about the same and your training starts to feel like it's getting harder. Right? So HRV is kind of a nice cross check to say, ooh, what was the biggest change we made? Oh, we dropped our calories by an aggressive amount. Maybe that was a little bit too much too soon, the weekend course correct at that point. Mistake number two that I see. Again, these are generally more related to body composition is related to number one is people tend to cut carbohydrates too low too fast. And you'll see this sometimes in their HRV essay sometimes, because the caveat there depends on what type of exercise they're doing. If someone is really, really good at the use of fat, and most of their exercises, moderate aerobics based training, you may or may not see a big difference there. But if you're on the strength training side, you're training with weights 3456 times a week, or CrossFit or some high output exercise. And you dramatically slash your carbohydrates. This again, is a form of a stressor to your body. You need carbohydrates for high output work, especially speed and power based exercise. And it also helps with recovery. Now, of course, you can exercise on a lower carbohydrate approach that may be useful in some cases. But I'm generally a fan of higher amounts of carbohydrates. If your work is more on the strength training, high output side of the equation, carbohydrates are what is the best fuel for that. If you're doing endurance work, and it's really more moderate to lower intensity, longer duration, you don't have a lot of speed and power requirements. Yeah, then you can get by on a very low carbohydrate approach or maybe even potentially a ketogenic type approach. So if someone is doing more aggressive weight training, they were higher amounts of carbohydrates. They slashed their carbohydrates quite the low overnight to maybe they went from 350 grams of carbs per day. 200 grams of carbs per day, which again, is my

opinion too aggressive too soon. Most of the time, you will see HRV will show that their body is being more stressed. Again, we'll see self reported data there with energy performance in the gym also changing. So number two people aggressively cutting the carbohydrates a little bit too much. I generally find that there's my call the metabolic no man's land, or even if you've been slowly walking your carbohydrate hydrates down. Most people will struggle between the once they get around below 100 grams of total carbs per day. At that point, unless you're doing this for a competition or something very short term, you may consider switching to a ketogenic diet at that point, I just find people hanging out at the 70 to 80 grams of low carbs, and still trying to do some weight training and hanging out there for long periods of time. They just don't really do very good, not enough carbohydrates to really support what they're doing. But it's a little bit too high to be entirely in a ketogenic approach where you're using a lot of alternative fuels, such as a ketone bodies themselves. Number three, is related to sleep. Most people know that sleep is super important, as you're talking about in the flex diet cert, it's actually ranked number eight out of the eight interventions that we do. That's not necessarily for physiologic reasons, that's more for the psychology for the clients ability to change is generally low. But low sleep, or if you see a big change in sleep HRV can be a really useful tool. So let's say you've got someone who's super motivated, they've been sleeping on average, six hours a night, and they said, Okay, I can give you a four week period, rather do everything possible, and I'm gonna go to bed two hours earlier. So in theory, I get another extra hour and a half asleep per night, they may not necessarily feel amazing right away, most people have the high amount of sleep that they need to repay. Right, just like remember that fatigue also accumulates. Just because you took one day off, doesn't mean if you're really beating the crap out of yourself for three weeks before that all your fatigue is gonna magically disappear in that one day. Same thing with sleep. If you've been getting very low amounts of sleep for many months, two years, getting one night asleep, that's longer can help. But you may not feel like you're completely refreshed at that point. However, as you're sleeping more, even though you may not necessarily feel better, we can watch your HRV start going up. In most cases, this says that we are decreasing the amount of sympathetic stress, ie are becoming more parasympathetic on your HRV do you actually are getting to be more recovered from a nervous system point of view, this can serve as a positive reinforcement, that the habit you're doing, even though it's quite difficult, is useful, that you are moving in the right direction. On the other side, it can be the useful tool, if you're someone who gets a lot of sleep, I love my sleep. And if it's been a couple of nights where it's been a lot shorter, maybe I'm thinking I can get away with it for a couple more nights. Or look at my HRV. And in general, it'll start to drop, it's becoming more sympathetic. That's telling me that Yep, yeah, one or two nights, I'm probably pretty good. But after that, I'm definitely gonna start paying a heavier price for it. So HRV again, so there's this kind of a nice cross check to look at sleep. Depending upon either condition. Whether you're someone who is trying to get more sleep, and is actually doing the

behaviors, or you have a client that's doing that, you can get some positive reinforcement to keep them moving in the correct direction. Or if you normally see pretty good, you're thinking you can get by with a few more nights, you can see that your body is getting more stressed, even though you may still feel okay. And then you may have to change your plans around with that. The my biases, I think the inflammation in the flex diet, cert will definitely get people moving in the right direction for better performance and body composition. Of course, I'm biased because I'm one who designed and developed it. And I think that HRV serves as a really good add on because it allows you to make things a little bit more practical. And with the three examples I have here, serve as a cross check to making sure you're on the right path, or for yourself to see if you get a little bit too aggressive. You get some early feedback, hopefully before you completely implode yourself. So there's a little rundown of heart rate variability and the flex diet certification or nutrition modifications and recovery. If you want more, go to flex diet calm, FL exdt.com for all the details. And after this I have a short q&a that I did with Dr. Lonnie Lowery and some of his students. We've worked on a poster that we've presented this year at the International Society of sports nutrition, Lani supervise the students there who collected some great data looking at the effects of coffee and heart rate variability, and even got first place for presentation of their poster for undergrads, which is awesome. So if you want more details on heart rate variability, listen in now to the q&a here, I did with the students all about heart rate variability. Thank you so much for listening to the flex diet podcast, really appreciate it. If you're listening to this, today, as it came out, which is Monday, July 26, you haven't till midnight tonight, Pacific Standard Time to still enroll in the flex diet certification, you can get the HRV education course there. At the same time, also go to flex diet. com for all of the details. If you're listening to this after that date, you can still go to flex, diet calm, have all the info there. And you can get on to the waitlist and the newsletter to be notified as soon as it opens again, which right now looks like probably sometime later this fall. So thank you so much. I really appreciate it. Take care, quick presentation from some students about coffee and HRV, which you are aware of Yes.

26:33

What I thought you might be able to do is just sort of inform everybody a little bit about what HRV is doing and the scales that are used in the background, because we're sticking to just that 100 composite scale. Perfect. Yeah. So yeah, just how it works, and what it's actually analyzing and how the app gives us that 100 scale.

D Dr. Mike T Nelson 26:58

Yeah, so a couple things. So if we back all the way up, our assumption is that the state of the healthy system has fine scale variability kind of built into it, which goes against a little

bit of what most people think, right. So if we take the example of HRV, looking at the cardiac system, most people if you would pull them would be like, Oh, if you're at rest your hearts, just like a metronome. It's exactly, you know, 70 beats a minute, it's exactly 70 beats a minute. And as all of you know that that's actually not true, we have this little bit of variability. So if we look at it in beats per minute, which is just easier for people to understand, at rest, not doing anything else, you may be at 69.7, the next beat, maybe 71.1 70.3 68.9. There's this little bit of variability that shows up when you look at the data from one beat to the next. And it turns out that that little bit of variability that find scale differences, is a marker of health. So we do heart rate variability analysis, we can get resting heart rate, which is an average and gives us some pretty good data, we can do a variability analysis, and that gives us the next level down. So instead of averaging all of those beats, we're going to look for how different Are they from one beat to the next. So that 10 pour all that information related to time, how it's different over time actually matters. So when we run the heart rate variability analysis, we'll explain the methods to do that real quick. That's telling us on average, what are the two branches of the autonomic nervous system, how much of that is the parasympathetic, rest and digest? How much of that is the sympathetic system, more of the stress fight or flight freeze response. So the average will give us some info during the heart rate variability analysis will give us the status of the autonomic nervous system. So for better or worse, all HRV will ever really tell us at least the data we have now that's there's some interesting stuff in frequency domain we'll get into. But in general time domain analysis, which was done in this study, that will only really tell us the status of the autonomic nervous system. And when we do that, the numbers that we get out are something called the time domain method. So there's really three ways you can do heart rate variability analysis, you can do what's called time domain analysis, which is what was done here, you can do a frequency based analysis. So if you ever see them reporting, high frequency, low frequency, you know ultra low frequency, that's from something different called the frequency domain. And then you can do what's called a nonlinear methods, soil sample entropy, different plots like that. So if we go back to how the data was collected, for the most accurate data in a very short window, ie we're only grabbing data for literally 55 seconds. The literature right now only really supports doing a time domain analysis for that. If you get up to maybe three to five minutes, maybe you could do a frequency based thing that gets pretty messy. So when the time domain, we're looking at literally the difference in milliseconds of the variability, right, so if you report say, 10 milliseconds is your raw output from doing a time domain analysis that says, ooh, there isn't really a lot of variability in that system, compared to say, 89 milliseconds, ooh, a lot more variability there. So the more fine scale variability you have, the more you're actually on the parasympathetic side. So as you become more and more stressed, you can do this by doing live HRV measurements as someone is doing exercise, right. So they're having that withdrawal of the vagal tone. And they're having sympathetic stimulation, especially over a heart rate of

100, you'll see your heart rate variability goes away, right, you're becoming having less variability during higher intensity exercise. So on the app, because what happens is, most people, if you just report what HRV is, in milliseconds, they'd have no frame of reference. So that doesn't make any sense to them at all. So aura data, if you have like an aura ring like I do, they actually do report the milliseconds on the app itself. So for the iPhone app, what they did is they said, Okay, we're just going to use an algorithm, and we're gonna translate that to about a one to 100 score, because most people, if you give them those kind of bookends, it just makes a lot more sense to them. 100 being extremely parasympathetic, so having a lot of fine scale variability, and in some rare cases, you can go over 100, it's not actually kept there. One would be, you have literally zero like nothing. The lowest HRV score on IO fleet I've ever seen was a guy in the 30s, he was in the 80s, and dropped all the way to the 30s. He was in the UK at the time assignment told me about this. And suddenly the data, he was admitted to the ER for bird flu at the time, actually. So it just just massively dropped. Wow. So by just taking that algorithm in the background, they translate it to a one to 100 scale. So when you're looking at the app, you'll see your resting heart rate, and then you'll see your HRV score on a one to 100 scale, which is just easier for people to interpret.

32:47

No, that makes sense. I appreciate that. Because of course, yeah. But so when these guys are asked at a conference, you know, can you explain the scale that you're using, they're just going to respond with? Well, it's, it's actually looking at a time domain, it's looking at variants in the AR waves, right of the of their heart rate, and then just basically providing that in a simplified scale.

D Dr. Mike T Nelson 33:15

Yep. So what they do is the processor will look at what's called the RR intervals, right? So you have your raw EKG that comes off, you've got the poynting our waves, and the algorithm then has to determine from the peak of one our wave to the peak of that next our wave, how many milliseconds that is. So that was the downside with getting the software on the phone was making sure you can pick off that R wave very exact, right? Because if you think back to some of the examples we're given, we're given examples in milliseconds. So if your detection is off by, say, 20 to 30 milliseconds of where that R wave is actually in space, your HRV analysis is screwed For starters, right? So you have to pick off that our way very accurately within a few milliseconds. And that gives you your raw data, which is something called the RR intervals. So if we were to take the raw data, if we were to capture this without using the algorithm, we would see stuff like, you know, 603 615 617, write again, this will be for a rate of 100. But you would see the actual milliseconds

there. And then the algorithm uses what's called a time domain analysis. It's what's called RMS SD, if you want to be very specific. It's just a mathematical way of determining how much variability is there. And it's still in what's called the time domain. So we don't transfer it all right, because the data we pulled up from one wave to the next our wave is in milliseconds. So it's still in that that time domain. The algorithm will just determine how much variability there is. That's done reported in milliseconds. They take that number and just translate it to the one to 100 scale. So what you're looking at is the amount of variants are very ability in that measurement itself. And usually people have a mental thing that like with heart rate, they're like, Oh, so as heart rate goes up, that is an indication of more sympathetic stress. HRV is inverted of that. A higher HRV is indicative of actually more parasympathetic, not sympathetic. Okay, any questions about that? Make sense?

35:29

You mentioned the aura ring, maybe just a few comments about the different ways that athletes do this. I mean, it's primarily sold as an overtraining stress monitor, is that accurate? And if so, like what kind of devices are out there?

D Dr. Mike T Nelson 35:44

Yeah. So now everyone's putting HRV and frickin everything, right, because they're getting to the point where they can grab heart rate data pretty good. So there's a couple different ways. So the main way is EKG, old school, we're actually pulling off the electrical signals themselves directly from the heart tissue, that has the advantage of being relatively accurate if the rest of your equipment is pretty good. So if you go all the way back in time, like when I collected data for HRV, and my PhD, we literally had an old school strap, we would put on people, we had an EKG, and we had to manually figure out with an algorithm where those peaks were, I had to write a specific MATLAB code to translate that. And then I entered into another program called kudos. Although that was a pain in the ass, right. So now it's a lot easier, which is good. So we can pull electrical data directly. The other way is we can get kind of what is a surrogate marker of looking at pulse pressure, it's everybody knows this, if you take and do old school pulse on your hand or on your neck, you can feel the beat of the heart because the electrical signal translated to pressure difference, and you can see when that comes by. So now with like a watch, I have a Garmin Phoenix watch, that little light in the back on the wrist is looking for that pulse pressure as it comes by, with aura did is they used actually the finger. So all the engineers from war are actually originally from in Finland from polar, they kind of sniped a lot of their engineers. But the reason they did it as a ring is because the finger vessel is relatively

anatomically pretty similar from one person to the next across a wide demographic population, the risk, the vessel is not as close to the skin and is not usually in the same spot as much. So with the wrist, you need a higher powered light, and you have more air in that data. So by doing a ring, they're able to get very close to the vessel. And they can literally pick off exactly when that pulse pressure comes by. And if you can map that really accurately, which they've shown right, they'll still sample it like 250 times a second, they can literally get the pulse wave as it comes by. And when you do that, you can get the peak of that our wave per se, even though we're looking at a pulse pressure wave, and then we can get our intervals. And then we can calculate heart rate variability. The downside is that it is doing it over the course of the entire night. The Pro is Mo, we're actually gathering more data, we're gathering it from an athlete that's in a resting state. However, as you know, if you look at dreams, REM sleep deep sleep, your heart rate, and even your heart rate variability over the course of night is going to change. So aura saying, okay, we're going to grab all this data when you're asleep. And we're going to just run HRV for that entire sequence. So historically, that's what they used to do in hospitals and other settings, you'd see 12 hour 24 hour recordings, that'll be reported back to you in milliseconds. So it's using time domain analysis again, in the morning. Now, the downside is if you're trying to compare that to say how athlete is typically used, where you sit down or lay down, or you stand, and you do a one time measurement first thing in the morning for just 55 seconds. So you're gathering data over two different basically times, and the length of the data is different. So in practice, what I see with ra is, yeah, it'll get you kind of in the ballpark. Like if you do things like have a couple adult style beverages or don't sleep well or you're really stressed, it will definitely change. But I find that it doesn't change as fast related to other stressors, meaning that with the single point measurement, it's usually closer to the day also of where you're starting. And most of the literature that's been reported, at least for athletic training, typically has used a single point measurement in the morning. So even when I collected my data for the energy drink study, we had people come in, they would be rested and we would go out the data point for heart rate variability first thing in the morning. And then we will go on and do the rest of the experiment. So with aura, I find that it'll get you kind of in the ballpark. But because I think it's averaging, so to speak, taking all that data over the course of the night, it doesn't move as much, meaning that if they had a really hard training day, I don't all the time see it as a change in aura. If their lifestyle goes completely to crap, and they're just utterly trashed, yeah, I will see that it kind of changes. The last part that makes it even more confusing, is if you're looking at high level athletes, especially endurance level athletes, I have some athletes where my buddy Ryan, his resting heart rate on aura, when he's asleep, is gets down into like 3738, labs are strong, his heart rate was supposedly in the 30s. So if you have someone who has a very low resting heart rate, think about the dynamics of what's going on with their autonomic nervous system, they have a huge amount of vagal tone, or a lot of this parasympathetic input, because their heart rate is

very low, because of mostly in training. Now, when we look at heart rate variability analysis, we really want to determine what are affected by a lot of the other stressors, primarily training, if we have someone who has this really high amount of vagal, tone and parasympathetic tone at rest, a lot of the other stressors kind of sort of get washed away, right, it's like imagine you're sitting on a beach looking for a small wave, and you just see big waves all the time. So in practice, what they do to get around that is, most of the time with iPhone, you'll do the measurements seated or like the case of athlete, Ryan, he doesn't actually standing. So what we're doing is we're trying to put a little bit of sympathetic stress into the system, to try to get them out of this massive amount of parasympathetic that they're in all the time because of chronic training adaptations. So he'll do it standing in the morning. So he'll get up, he'll stand up, you'll stand there for about one to two minutes, right, so his system is still hitting equilibrium. But his resting heart rate is going to be a little bit higher, right, because they have a sympathetic output, because now the heart has to work more against gravity. And that little bit of sympathetic output gets him away from that massive amount of parasympathetic tone. And then we'll do that every day. So his measurement is always done in a standing position. So that amount of stress from standing just gets kind of washed away. And what we find is that his training and other stressors will now show up in his measurement, when we had them do it just as an experiment to see what would happen, we had them do it laying down all the time in the morning, like we could just murder himself in the gym for two days in a row before his HRV wouldn't really move all that much. So if you have aura, it's collecting it at night when they're sleeping, and they're laying down. So if you have someone who has a really low resting heart rate, they have a lot of this parasympathetic tone all the time, their HRV, in general is not going to want to move a lot, which is a good thing, right? It's showing that they're actually more resistant to other stressors. The downside is when we're trying to use it for more kind of diagnostic measurements, it's not going to be as accurate, you can look in the literature for something was called parasympathetic saturation. It's a little bit debatable about how much of an issue it is. But I've noticed with people with very low resting heart rates, having them do is seated or standing is a lot more accurate and representational of other stressors.

43:37

That's interesting. So we should keep an eye out for hyper fit aerobic athletes in our coffee research, because that's going to affect them in the morning.

D Dr. Mike T Nelson 43:48

Yeah, so most of the time seated, you're going to be okay, see, does give me just enough of that stressor to get most people out of that area. But if I started seeing people who on a

seated measure are hitting like the low 40s, then I'm starting to think yeah, we might be having this massive amount of parasympathetic saturation. So one of the things I look at for HRV peer review, especially in athletes is like send me all your raw data. And I want to look at where their resting heart rates are. Right? If they said, Hey, we collected at laying down and the average resting heart rates and like the low 40s or high 30s. He that's making me a little bit uneasy at that point. Okay, that makes sense. Last thing, just fun. Yeah.

44:34

What have you seen? I know you monitor a lot of clients, you like a lot of monitoring devices, your engineering kind of mind. What what are things that really tank you mentioned adult beverages? Yes. What are some of the things that really reduce HRV and would make someone look strung out? Yeah.

D Dr. Mike T Nelson 44:54

super fascinating question. And so I've been doing daily HRV monitoring on myself and colon Lyons for probably over almost eight Coming up on eight years now. So I probably looked at more data on a day by day basis than almost anybody else. And, in general, you'll see if you aggregate all the data, you know, you'll see this stuff you would expect high training volumes, especially higher intensity training, less sleep, poor nutrition, which could be quality or quantity, argumentative stressors, they had an argue with their boyfriend, girlfriend, spouse, you know, whatever. All those things show up. What's fascinating, though, is that it can be completely different on an individual basis. Meaning I've had people get in a mouse of argument with their spouse before training, and one person in particular whole remain nameless. This is several years ago, not a current client. And his training was fine. And he said back he's like, Yeah, I got an argument. Like, why if bla bla bla, and I'm like, That's weird. So your HRV didn't change at all? Just like, yeah, whatever, I'm getting a divorce. I don't care like Oh, okay. Literally the same check in the next client had an argument with her, or spouse, and her HRV just tanked, like 12 points just dropped like a stone. So very individual for a person. The two things I've seen out of pretty much everyone that will have a significant change is sleep, especially if it's a chronic issue. So most people, their sleep is good. They can buffer one or two nights and they're okay. But if they're constantly getting four or five hours a night, I haven't seen anyone where their score has not been affected. I've seen people eat what I would consider like complete trash for nutrition and seem to be okay. I've seen them do. Also, I've seen people buffer crazy amounts of stress for training, they've been okay. But chronically low sleep, I haven't seen anyone get get through that. Right. And you guys have probably

talked about like the duck two mutation, and you know, that kind of stuff, which is pretty rare. The other one actually is alcohol. Like, I've seen people buffer one or two drinks sometimes and they're okay. But it's fascinating to me how even the type of alcohol appears to make a difference. Either people drink one glass of red wine and the rates or V will plummet, they can drink two glasses of white wine and be okay. I can even change you know, kind of the quality of the red wine and be different. At first I thought it was more impurities. But then I had people who would drink like tequila or even like high end vodka and it would still happen. So one person he can drink. Vodka, fine. Tequila, one shot will tank his HRV like 13 points. It's just, it's weird the amount of variability in alcohol that I see. And I can't figure out what the pattern is. And it's just different from one person to the next. So those are the kind of some of the patterns I've seen.

47:53

Right? It sounds like drinking for athletes that are in hard training is just no bueno.

D Dr. Mike T Nelson 47:58

Right? Yeah. You know, I've seen people who can buffer like one or two drinks, they have a beer or whatever, later in the evening, I don't see it show up in their score too much. But getting above two, I would say is generally kind of the threshold. You know, one guy looked at a score, and I was like, holy crap. I'm like, what happened to you, man? And then I looked at the date was January 1. And I'm like, I'm guessing you went out and had a few beverages last night? Like, yeah, I stopped counting like, okay, that explains like about a 17. point right the next day?

48:37

Geez, yeah, in similar what you're saying my alcohol is fascinating to me, because one of the things that I've wanted to do, just with the simple the, you know, the chest strap in the app is just look at different stimulants and how they affect HRV differently, right. Nick and I have been talking about that one of the next one of the students is going to present down in Florida. That things like caffeine, arguably, right? The literature goes back and forth, but it looks like raises HRV and then I've never seen a number like you down in the 30s my god. One one person came in forgot to mention Adderall use row. Yes. He talks about that.

D Dr. Mike T Nelson 49:16

And limit HRV. Yeah, I've seen that multiple times. 52. Yeah, yeah.

49:24

It's fascinating how different things are different stressors to different people, you know?

D Dr. Mike T Nelson 49:29

Yeah, yeah. Adderall is the one I've seen. I probably have like five case studies now where the client didn't tell me at all. So like week to week, we got a baseline HRV one client in particular had baseline HRV for eight months. We did all their training, nutrition. All of a sudden the week just just dropped more than and had an entire eight months even after overreaching and everything with training. And I asked him as a man was what what the hell happened to you? I'm thinking they're getting a divorce or they're moving their house or they got sick. It Like, oh, I have ADHD and my doc gave me Adderall. And so, you know, we worked with their doc and said, okay, is it okay? If we, you know, run an experiment where they take it some days and other days, they didn't need it every single day. And like clockwork, like once it was out of their system, their HRV would go back to normal. The second they took it, it would plummet like 2020 on athletes. 20 points.

50:23

Yeah, that really corroborates what we saw. Yeah. All right. Well, good stuff. Dr. Nelson. I appreciate it are the club's running out of time? No worries. But thanks. We needed the expert input. So thanks again. Yeah, awesome. Thanks, guys. Bye.