[00:00:00] **Dr Mike T Nelson:** ,

[00:00:00] Welcome back to the Flex Diet Podcast. I'm your host, Dr. Mike T. Nelson, and on this podcast we talk about all things to improve your performance in the gym, add more muscle, and improve your body composition, and do all of it without destroying your health in a flexible way or method. Today on the podcast, I've got my buddy Evan Peikon.

[00:00:28] And we're talking all about his new device, the company he works for now, called Knox. This is a really cool device. As of the time of this recording, I have not yet had a chance to use it, but it's definitely on my list to play around with. I have used metabolic cards before. I do have a Moxy set up here also, so I'm somewhat familiar with the technology, but with this new device, what they're able to do.

[00:00:55] Is to measure nitric oxide in real time. You also get muscle oxygenation and oxygen consumption in addition to some other measurements. If all that sounds like Greek to you, Evan walks us through why these measurements are useful, how you can use the data, and even if you don't have any plans of adding any technology to your training we review a lot of solid training principles.

[00:01:22] That I think once you understand them will definitely help you program better for yourself and for your clients. Evan is just a wealth of legitimate hardcore physiology knowledge, so it's always wonderful to chat with him. And if you enjoy this geeky chat here and you want more information, make sure to check out my newsletter.

[00:01:46] Go to miketnelson.com. For all the information there, you can hop onto the newsletter for free. We'll even give you a free gift. I go to mike t nelson.com and most of the writing I have and content goes out exclusively to the Fitness Insider Newsletter there, and it is free to join. And if for some odd reason you don't like it, you can unsubscribe at any point.

[00:02:10] We will miss you, but totally understand. So enjoy this hardcore physiology conversation about nitric oxide, muscle oxidation, how to maximize your performance both in the gym and for your sport with the one and only Evan Peikon.

[00:02:31]

[00:02:32] **Dr Mike T Nelson:** Welcome back to the Flex Diet Podcast, and today we're here with Evan Peikon. How's it going man?

[00:02:38] **Evan Peikon:** It's going great. How are you?

[00:02:40] **Dr Mike T Nelson:** Good. Thank you so much for being on the podcast here. I know we've chatted off and on over the years and very nice to see you here. Thank you for your time. Yeah, of course. Thanks for having me on. Yeah, and I think we're just talking before we started that you've got a new I guess would you consider it a wearable or a new physiologic measuring device?

[00:03:01] Sounds a little bit better. Wearables, I feel is fraught with all sorts of landmines these days.

[00:03:08] **Evan Peikon:** Yeah. We call it a wearable

[00:03:10] **Dr Mike T Nelson:** just because colloquially that's

[00:03:13] **Evan Peikon:** to hearing. But yeah, that, really you're hitting on one of the main reasons why we ended up developing this device in the first place, which is that we were just generally unsatisfied with the wearables

[00:03:24] **Dr Mike T Nelson:** that were available prior.

[00:03:26] Yeah. So what was the issue with wearables you were looking to resolve?

[00:03:29] **Evan Peikon:** Yeah, so to me it's really two things. One is you look at the bulk of wearables on the market and they all effectively measure the same three to five different things. You got heart rate, you have blood oxygenation, you have H R V and various derivatives of that.

[00:03:46] And those things are all great, but they've existed for a long time and I'm like you, I'm always looking for the next big thing. Always trying to explore physiology and performance in a little bit more of a nuanced way. And there's just so much you could get from heart rate and blood oxygenation, the same things that we've been looking at forever.

[00:04:04] So that was definitely one of them. The other was that we wanted to measure things that have a little bit more of a transformative impact on health or performance. So again, going beyond the same few things that every wearable

captures, competing on things besides form factor. You look at Apple Watch, whoop, or Ring.

[00:04:25] Say measurements, different way of strapping it to your body or interfacing with that data in an app. So that was really the starting point. And then from there it was a matter of figuring out what do we actually wanna measure with this thing? And then that's a whole two years of my life working on that.

[00:04:43] **Dr Mike T Nelson:** How did you go through that process? I think it'd be interesting because I think for a lot of people what I see is that, oh, we have this new look at the history of HRV, right? Which you're very familiar with. Initially it was, when I was doing my PhD, one of my topics is H rv. We had 10 grand worth of used lab equipment.

[00:05:00] I had to freaking write a mat lab code to translate most of it. Thank God Kubis had just come on the market so I could upload raw RRS in there, so I didn't have to do all the analysis per se. Fast forward, I think it was one of the first companies that said, Hey, you can just use a heart rate strap in your phone and get it, and now you can.

[00:05:19] HRV is being thrown onto everything for better or worse. And I've lost a couple of contracts because they're like, Hey, we want you to help consult for HRV thing. I'm like, okay, let's do initial thing. I said, Hey, what's your idea? I'm like, that's a stupid idea. Like, why would you ever do that? You go, let's measure HRV 24 hours a day.

[00:05:39] I'm like, you have no context. What if they're exercising? What if they're running to the bus? What if, and they're gonna look and go, oh my God, it says I'm very sympathetic and they're gonna lose their shit, so

[00:05:49] **Evan Peikon:** better yet, randomly sampling throughout the day, just getting, yeah, sta data points day to day, different times a day and trying

[00:05:56] **Dr Mike T Nelson:** to compare them.

[00:05:56] It's crazy. Yeah. And they're not, a lot times they're not validated. There's no gauge r and r, and then they get mad at me and then they, I never talk to 'em again. But it seems like the general trend is we have this technology. Let's just try to put it in everything. And it sounds like you're doing the opposite of Hey, what do we actually wanna know?

[00:06:13] What are things we should be looking for? And then let's maybe go look at some other technologies instead of trying to shoehorn existing technology into every little device known to

[00:06:24] **Evan Peikon:** man. Yeah, it was very much working backward from the end point. So what are the end points that we're looking for?

[00:06:29] One, I want a better way to personalize strength and conditioning. We all know lot of inter-individual response.

[00:06:36] **Dr Mike T Nelson:** You're not all the same.

[00:06:38] **Evan Peikon:** Apparently not. Yeah, E everyone knows this. Obviously inter individual responses are a huge thing. It's a reason why 10 people could do a CrossFit group class and one guy ends up gonna the games two years later and everyone else may not progress.

[00:06:53] There's not a lot of great ways to predict who's going to be the one that adapts and thrives and who isn't though another one, this one is near and dear to me, working with CrossFit athletes for a number of years is load management. It's just a nightmare with mixed sports. If you have runners, it's pretty straightforward.

[00:07:08] How many miles are you running per week? Yeah. What are the speeds? If you're a weightlifter, same thing. It's pretty straightforward. If you're a CrossFit athlete, how do you equate volume between squats and wall balls and running and assault, biking? I have no idea. I really never figured that out even when I was coaching top CrossFit games competitors.

[00:07:26] So that was one that re we really wanted to try and solve. And then a third one was being able to track progress over time and do it in an easy way. So like yourself, I've gone on the deep end with a lot of technologies. Some are great lab grade pieces of tech, but user interface is not fantastic.

[00:07:45] **Dr Mike T Nelson:** So Moxie device early on.

[00:07:49] Yeah, exactly. I told Roger this to, to him, so it's not like a big secret and they are getting so much better with it, thank God. But yeah, the early stuff was just like, What do I need another computer? I need what to put on this thing. I need to drag my computer out to my garage. Say, what are you doing?

[00:08:05] **Evan Peikon:** Yeah. I originally learned how to code solely to be able to automate my analysis for all of these technologies. So yeah. If it's easier to spend six months learning to code and

[00:08:17] **Dr Mike T Nelson:** to get the data, yeah, your interface may suck.

[00:08:20] **Evan Peikon:** I'm really telling you something. That's where we started.

[00:08:22] Muscle Oxygenation was one of the first things that we thought about that man, I think there's something to that measurement for solving these different problems. Yeah. But we couldn't really stop there because one of the big problems with the interpretation of muscle oxygenation is that you don't have blood flow.

[00:08:38] A lot of people in the nearest community, they say T H B, which is total hemoglobin, it's a measure of blood volume. They'll say, that's blood flow. Or they'll say just look at the change in T H B, and you could interpret that as blood flow. Definitely can't do that. If you ever take a Doppler ultrasound and compare the actual blood flow measurement with T H B measurement on something like AM Moxi very weakly correlated.

[00:09:00] So clearly that T H B signal is in blood flow. So one of the things that we wanted to do is say what regulates blood flow in the microvasculature? Turns out the molecule that does that is a form of nitric oxide that rides on the red blood cell and is released in response to deoxy oxygenation. The real full and long name for that molecule is SS nitroso hemoglobin or snow hemoglobin for short, let's call that active nitric oxide 'cause it's a little bit of a mouthful.

[00:09:28] So we want to see could we measure this because it's never been measured non-invasively and there's only about three labs in the US to the best of my knowledge that can make that measurement and ballparking off the top of my head, I believe it costs about 250 gram to make that measurement in blood.

[00:09:44] So we're like, could we do that non-invasively on the cheap and in real time? We spent a really long time working on that, but we eventually got to that point and then that allowed us to unlock another series of measurements. Once you could measure active nitric oxide, you could measure a lot of other things as well, like oxygen consumption in the tissue or the amount of metabolic work that a tissue does.

[00:10:07] And those were the main things that we started with on the NOx wearable. 'cause it's a small device, technology is rapidly getting better. We just tacked a lot of fun extras into there too, like skin temperature, accelerometry, and you start packing measurements. And so that's how we ended up where we are today.

[00:10:24] **Dr Mike T Nelson:** Very cool. And to back up a little bit, so one of the things I noticed on Moxie, which I do I have a three set up moxie system, I think it's useful. But the blood flow thing always bothered me a little bit and critics rightfully so of that technology would say that. You're not really measuring blood flow, you're measuring this at best, this quote surrogate kind of marker and you would see a change, right?

[00:10:46] So you can play with, partial vascular occlusion like so blood flow restriction where you're purposely just physically changing blood flow to, high rep, horrible sets where the muscles contracting so much. You're probably getting some occlusion of the vessels and you would, at least I would see some changes in it, but over time I just threw that measurement out because I didn't know what to do with it other than seeing it kind of change within a session at a harder time using it sort of session to session.

[00:11:17] And I ended up just looking at SM O two. Okay. For me, if I'm doing something, I'm warmed up, 85, 86 is the max I can ever get to. So if I walk in cold, I'm at 70, probably need to do a little bit more of a warmup, right? I want to get to the highest value I can get before I start depleting it.

[00:11:35] And then you can play around with, okay, how far do I want to go down? And, deplete it depending upon the intensity of exercise. So that's how I ended up using it. Which maybe is a little bit crude, so I don't know what your thoughts are on that.

[00:11:47] **Evan Peikon:** Yeah I think for the total hemoglobin, I am definitely more in the same camp as you.

[00:11:53] It's actually something we debated if we want to even display that when people use the Maxima, we decided no, we're not even gonna. Okay. And it's for the reason that you mentioned it, you can look at it, you could see these trends over the course of a workout. And when you take a really simple interpretation of it, I definitely used to be much more in like the Yrg Feldman camp.

[00:12:13] So people that know years and have used Moxie will know who Yrg is. Really awesome sports scientists that frankly contribute a ton to the interpretation of these types of measurements. But one of the things that Yrg talked about, this is maybe 10 years ago, Is that you can look at the T h B signal and use that to infer whether someone is compressing the tissue, getting venous occlusion or arterial occlusion.

[00:12:36] And I was definitely in that camp as well. I've taught that in courses in the past and after spending a lot more time with those measurements, realize you absolutely cannot do that. So mechanical factors do impact that total hemoglobin measurement. But there are also metabolic factors that impact it, like hypoxic vasodilation.

[00:12:55] They're also neurological factors that impact it, like sympathetic vasoconstriction. So you have these three competing forces that are all impacting that T H B measurement, that and ePen time and NEA in time, and you have no way of knowing which of those is actually impacting the measurement. So in terms of interpreting, it could have a response where s O two goes down and T H B goes up and people would say, that's venous seclusion.

[00:13:19] Or it's hypoxic vasodilation. Both of them wouldn't look exactly that way. Or you could say it's a muscle compression, or it could be sympathetic vasoconstriction. We have no idea. But theoretically, the T H B response will look the same in both of those instances. So that's why I ended up just throwing that signal away and really focusing on muscle oxygenation for a number of years, because that is a little bit more of a straightforward measurement.

[00:13:42] Is it going up? Is it going down, or is it flat line? And based on which of those three oxygen supply is either greater than demand, less than demand, or equal. So that's where I think having some of these other measurements does add a lot to the interpretation. You could start to triangulate and then go beyond just snowing what the supply and demand situation is.

[00:14:04] **Dr Mike T Nelson:** Yeah, and for listeners, like a lot of these. Measurements are not super easy. So part of my PhD that never I published part of it in imaging study was looking at F M D, right? So flow mediated dilation. So we'd have people come into the lab, we would take a blood pressure cuff, we would occlude around their forearm.

[00:14:20] We would take literally an ultrasound probe, stick it on their upper arm, try to find, one of the main vessels there. So you're trying to directly image

this vessel, which is horrible because you're trying to hold this thing exactly where it is. And we got this arm apparatus and stuff, and the person's sitting there with their arm going numb and you hit a little button and it allows all the cuff to release.

[00:14:41] So you have all the blood flow that comes in. So you see with the sheer stress across the vessel wall, which causes all these local changes, which we'll talk about, and the vessel would dilate a different amount. It sounds great, and in the theory there's tons of data to support it. But when you actually do the measurement itself, I realize man, this thing is touchy as hell, even under the best circumstance because you're imaging a vessel from the side and the imaging technology has definitely gotten a lot better. But you have to figure out where exactly is the vessel wall and where is the blood flow. And a lot of times you're grabbing these kind of static pictures in order to do the post-analysis.

[00:15:21] So I got really pissed off one day and then I went in there and there's an algorithm that'll put in the vessel wall for you. And some of the images I had were borderline. We ended up throwing 'em out, not using some of 'em. It's dropped the power of the study. But I went in and played around with, I think the wall is here.

[00:15:37] I think it's a little bit there. And I ran the analysis both ways and it was like really different. I was like, oh shit, because you think you're accurate when you're doing it? And I realized that, oh man, like if I don't have a really nice clear image, I don't trust any of that data at all. And I got lucky that most images I had when we did the post-processing were good enough.

[00:16:02] I had a few that I ended up just throwing out because I'm like, I'd ran it. I think it could be here or here. Then the results were like statistically significantly different. So all that to say that even when you've got direct imaging sometimes, and the ultrasound we had was like $120,000. It wasn't like a cheap one per se.

[00:16:20] Yeah. Even with direct imaging, it's not as sometimes as clear forward as what you would think that it is. And the mistake I had was reading a lot of these papers, it's described really well, but when you actually go and you try to do some of these measurements, it's a lot messier than what people realize.

[00:16:38] **Evan Peikon:** Yeah I've played around that and I've done some voluntary occlusion, put these sonography and Yeah. You don't realize how even like sneezing could

[00:16:45] **Dr Mike T Nelson:** just blow, oh, that'll fuck everything up like

[00:16:50] **Evan Peikon:** that testing, they'll put students literally with their arm in like a vice in two spots holding them down so they can't move a muscle.

[00:16:57] Yep. You just twitch and the whole analysis is shot. You can't even repeat it in the same day because you'll Nope. Wash out the effects. So yeah, it's, it, it's hard even working with those really high end lab grade pieces,

[00:17:10] **Dr Mike T Nelson:** equipment. For sure. So when you're doing non-invasive, how do you get around some of that stuff?

[00:17:15] Because you're strapping a device onto the outside of the muscle and you're expecting it to do stuff under movement, right? You're looking at stuff under exercise. I dunno if you just wanna talk a little bit about how do you know you're getting a decent signal? How do you try to get rid of.

[00:17:32] Some of the noise and does that kind of determine what you can, physically even use and end up putting in the final device?

[00:17:39] **Evan Peikon:** Yeah, totally. Yeah, one of the things that we learned early on is there's a lot of signal that you wouldn't expect to be in the muscle. So I remember three years ago I was Guinea pig number one with most of these technologies, and I was supposed to just be doing like a baseline sitting, resting measurement.

[00:17:59] So I took a measurement with a really early prototype of the NOx device. This thing looked like a game boy color, like strapped to my leg. It was humongous. Sent it to one of our engineers. He was like, are you like flexing your muscle like 15 times a minute or something? And I was like, no, I'm not moving, not doing anything.

[00:18:19] **Dr Mike T Nelson:** Oh, I wonder if it's for venous

[00:18:20] **Evan Peikon:** return. I was measuring my respiratory rate through my leg,

[00:18:24] **Dr Mike T Nelson:** really? Upper

[00:18:25] **Evan Peikon:** respiratory, we could pick that up, me in my calf. So we're like, huh, that's a weird thing. Didn't know you could get that through a leg muscle. 'cause you're essentially getting a pulsing of the artery.

[00:18:35] So there's that inside the muscle. When you move, obviously the muscle flexor is compressing the blood vessels under the sensor. So we're getting that. One of the things that ended up really helping is having a really fast measurement speed.

[00:18:48] **Dr Mike T Nelson:** It's like a high sampling rate per

[00:18:49] **Evan Peikon:** se, or, yeah, at one point we are sampling up to 200 times a second.

[00:18:54] So you're seeing everything going on. If the muscle contracts, you could see the changes. What ended up being great for us is, rather than that being something that we're trying to filter out the movement that ended up being a feature and not a bug. And I say that is, for example, with muscle oxygenation.

[00:19:11] If you're measuring it in the tissue, if you're compressing the muscle, let's say you're on a salt bike and you're riding at a hundred RPMs, so a hundred muscle contractions per minute, you could actually see the signal changing with each individual muscle contraction, squeezing the muscle. Instead of a lot of people, if you use Moxy, you're used to, you sprint on a bike and muscle oxygenation steadily goes down and then you stop and steadily comes up, realize that is not what the signal looks like when you're getting it in full speed

[00:19:38] **Dr Mike T Nelson:** instead.

[00:19:38] Oh. 'cause that's an averaged out signal, right? So you're not seeing the up and down, you're just seeing the average, so to

[00:19:44] **Evan Peikon:** speak. Exactly. So we would see like a complete zigzag where with a given muscle contraction you might drop oxygen down to 20% and then between contractions reoxygenation up to 60% and it would be zigzagging back and forth.

[00:19:57] So you have a micro trend, what's happening on a muscle contraction by muscle contraction basis. Then a macro trend what's happening over the course of 10, 20, 200 muscle contractions. So the speed ended up being something that worked in our favor in that regard. And then in terms of movement artifacts, that's always gonna be an issue even at rest.

[00:20:17] I. Again, ended up not really being a big deal. It didn't impact the quality of the measurements. And we do have accelerometers within the device, so we could correct for that as well if we

[00:20:26] **Dr Mike T Nelson:** had to. So that micro movement then, is that something that I'm hypothesizing here would be useful? So let's say you, you put someone on an assault bike, you tell 'em to do, I don't know, do 200 watts, right?

[00:20:41] Just a continuous exercise thing. And you're seeing between muscle contraction, someone who, for lack of a better word, desats all the way down to 15, but then only goes up to 50 versus someone else who desats to 15 goes back to 70 versus someone who goes from 40 to 20. I think you would probably infer that those, even though they're doing the same output, they're doing 200 watts that.

[00:21:07] Maybe those three people are different profiles then.

[00:21:10] **Evan Peikon:** Yeah. And if you were to take like a smoothed out trend for those three people, the smoothed out version might actually look the same in those three

[00:21:17] **Dr Mike T Nelson:** cases. That was my next question. Yeah. So that's, does the micro match

[00:21:21] **Evan Peikon:** the macro?

[00:21:22] Yeah. So we have seen that where the smoothed out version could look very similar for two different people, but the very high sampling version could look different because they have a different dynamic range of the signal. What does that mean exactly? In practice? Yeah. I don't exactly know yet.

[00:21:37] That's gonna be one of the things that's fun about getting this technology into more people's hands. 'cause we're early stage startup small team. There's only so much that you could investigate. Yeah, totally. Things that I'm really curious about is one of those better than the other? We don't have enough data to say which of those is more common in a very high level athlete versus maybe an intermediate or beginner athlete.

[00:22:00] I don't know what the answer to that question is. I don't know if that's a trainable quality. I suspect some of it has to do with the force of contraction. So maybe how well coordinated this person, are they over

contracting relative to the effort or are they able to, have a nice rhythmic contraction where they're not squeezing the muscle any harder than they need to?

[00:22:19] It's like when you see someone on a rower who's not very well coordinated, maybe they come from a strength sport background and they're rowing like a two minute 500 split and you're like, it looks like you're deadlifting 400 pounds stroke.

[00:22:31] **Dr Mike T Nelson:** It is happening. The stroke rate's 15.

[00:22:34] **Evan Peikon:** Yeah. And you watch someone that you know, they're good at rowing.

[00:22:37] It's a very fluid movement and you could tell it's a relatively soft contraction with each one. I think that might be some of it, but time will tell.

[00:22:45] **Dr Mike T Nelson:** Yeah. It's one tip on rowing I've been trying to work on is that smooth is fast. Yeah. Because you look at like elite level rowers do crazy shit.

[00:22:53] And there's a wide variety of ways they start and stop, but. To me the craziest ones. Literally, it's go, maybe they do two hard poles and then if you watched them at, minute one versus minute five, you can't tell any damn difference. Yeah. And at the end they don't even look like they're that fatigued until you look at their face and they look like they wanna vomit over in the corner.

[00:23:16] Yeah. If you watched him doing the thing, you're like, I don't know. I don't think he's trying that hard. Yeah. But then again, that's what all elite level athletes do. Hussain Bolt runs a, world record and he finishes, he doesn't look that tired. Yeah.

[00:23:29] **Evan Peikon:** Yeah. And it's funny, you, you go to an elite marathon as well, and oh, you'd oggi getting ready to cross the finish line, and you're like, he looks, does he start?

[00:23:37] Yeah. You're like, maybe looks like he's a little tired, but like smiling doesn't look like he's in that much pain. But then he crosses the finish line and you see them crumble and you're like, oh, okay. That's interesting.

[00:23:50] **Dr Mike T Nelson:** Yeah. Which makes me think that if. A good enough measurement. Can you look at the data and once you know what a pattern of more efficiency is, if you just display that data, could someone kind of auto correct themselves to be more efficient?

[00:24:10] So with rowing, one thing I do is, okay, once you get to whatever your rate is, I want you to hold this average rate and try not to vary that much. And once they can do that, then I'm like, okay, can you do that with less effort? And they always look at you like what the hell's wrong with you?

[00:24:26] Can you make it look easier? But I want you to hold the same output. And they just give you this. I'm like, just try it. And yeah. Most of the time over practice they can get it. Even though I didn't give 'em a cue of push more through your foot or pull, whatever.

[00:24:38] I didn't give 'em any technical cues. It's almost like an external cue that their brain can try to figure out how to solve that problem. Yeah.

[00:24:46] **Evan Peikon:** Absolutely. Think that's, Feasible quality. Fu muscle oxygenation, things like that for feedback as well. Less with mechanical and technical cues, more with controlling, breathing, maybe Adjusting, yes, posture and position.

[00:24:59] And what most people will see is you could figure out how to manipulate your breathing and posture. Keep in mind, it doesn't mean just nasal breathing the whole time when you're trying to,

[00:25:08] **Dr Mike T Nelson:** what you're not supposed to. You can't nasal breathe for a max two K test. What do you're, oh man,

[00:25:13] **Evan Peikon:** yeah, we're gonna get in trouble for that one.

[00:25:16] But yeah you could figure out the proper breathing patterns, proper posture, and you could see one, you could actually change the relationship between oxygen supply and demand and this tissue based on doing those things. And also it generally feels easier. It's almost like doing the opposite of bodybuilding.

[00:25:30] You could do a bracelet curl with 30 pounds and you could say, oh, this is pretty easy. I could make this even easier if I slightly change my hand position. I change the way that I'm breathing through the rap. Or you could say,

I could make this as hard as possible by changing my hand positioning and breathing and shoulder angle.

[00:25:49] And one of those is better for hypertrophy. One of those is better if you were doing CrossFit for example. Not that they're competing in bicep curls, but the same general idea applies to other exercises. And I think you could take that same concept and layer it onto really any activity, whether you're rowing, biking,

[00:26:07] **Dr Mike T Nelson:** you name it.

[00:26:08] Yeah. And one of the key I've been working on, I don't have enough data on this and I need to play around with Moxy a little bit more to see if it can pick it up, based off of listening to some of your lectures and stuff too, that I'm like, okay, so if I'm doing a somewhat all out max, let's just stick with the rower.

[00:26:23] I've got devices on my quad. Yes. How much you can force, you can put into it. 'cause you're pointing against the flywheel matters. But then I also realize by looking at some other data from some other people that have been here and their VO two data and stuff. How fast you can get that muscle to relax in between each contraction, I think makes a huge difference for efficiency.

[00:26:47] And you've seen probably some of the, I don't remember what Russian researcher I was talking to Cal Dietz about this, that showed with their elite level athletes, it wasn't the speed of the contraction that was different. It was the speed of how fast they could get the muscle to relax. Yeah. And so I tried to do some techniques on the rower where again, I would try to hold the same wattage, but when I'm, just simple terms bringing the handle back, the muscles, quote unquote relaxed, the cue I gave myself was literally just relax.

[00:27:13] So it was like, go relax. Yeah. Anecdotally, again, I don't have a ton of data on this, it, my r p e of that session, even though it was harder mentally, was actually better for the same wattage. So in theory if you could relax the muscle, you could get more blood flow back into it, that second it's relaxed, then in theory you would have less fatigue as you would

[00:27:32] **Evan Peikon:** go again.

[00:27:33] And that makes a lot of sense. One of the things that I've played around with that for CrossFitters, and again, do I have data on what it's really doing? Any of that? No. Yeah. People subjectively said that this feels like it

helps them when they go back to their sport. Yes. In some instances, it's the best you're gonna get is using flywheels for CrossFit athletes.

[00:27:53] So anyone who's ever used a flywheel. Yeah. How punishing it is if you can't relax properly, it literally just horrible rip your hips off of your femurs or femurs outta your hips if you want. Because if you don't relax properly at the bottom, it literally sucks you down into the box. So you need to be able to contract with maximal speed, relax at the top so it's not a jarring motion pulling you down.

[00:28:17] And then when you get to the bottom of the movement, again, relax and change direction. So if you can learn to exert a lot of force and rhythmically squat on top of a fly box. It's much easier to do that when you do a CrossFit metcon and you're having to relax at the top and bottom of a rep when you're doing wall balls or thrusters or what have you.

[00:28:35] It's one of the things that I've found a lot of CrossFitters is there're one very tense individuals in many cases that isn't really true at the highest level, but that's very few and far between the people who are very soft and pliable. So most CrossFitters very tense individuals. And also it's like at intermediate levels of sprinting where people think the way to move faster is to try harder and they more, and instead of going faster, you just exhaust yourself quicker.

[00:29:07] It's very much the same thing. So it's teaching people the kind of like paradox of sprinting where you relax more and you try less in some ways and you go faster. And the same thing with CrossFit. It's trying, not trying as hard in some ways to actually move faster and exert yourself less. It's a contradictory thing, particularly when part of your sport is trying to get you as strong as possible and you're used to trying to maximally accelerate the bar and using dynamic effort work and things of that nature, which really almost teach you the opposite quality.

[00:29:39] Even breathing patterns, the way to brace, under load, it's a very different breathing pattern when you're trying to move a 95 pound barbell 50 times as fast as

[00:29:49] **Dr Mike T Nelson:** possible. Yeah. I always, if people have done golf, I explain it to 'em, even if they've, if they're not good at golf at all, I'm like, okay, go out to the driving range and I want you to just try to hit the ball as hard as you possibly can and then next time just try to hit it farther.

[00:30:06] You're probably not gonna apply the same amount of quote unquote effort and let me know which one's better. And everybody knows it's done that, the, if you just try to apply the maximum amount of effort and kill the ball, like it never goes well. It is just hybrid between.

[00:30:19] Somewhat fast, somewhat relaxed, right? Probably has to do with timing and everything else. Again, you watch any elite level athlete, like they just remember Dr. Cobb saying this years ago. It's like elite level athletes just make hard things look easy. You watch the N F L, you watch a receiver do a pattern, literally turns around and the ball's there catches, it runs in for a touchdown.

[00:30:37] It you're like, ah, I look like I could do that. Then you actually, if you've ever trained with any of these individuals, you realize how far statistically away they are. Yeah. From anything I would ever do, but they make it look so easy. You're like, oh, that looks easy.

[00:30:53] **Evan Peikon:** Yeah. Definitely The case of cross CI in Yeah.

[00:30:55] N F L players, you don't realize, one, how big they are and how fast they're huge. You see it in person and I had my mind blown working with some N F L players where I'm like one, these are literally the biggest people I've ever seen. I didn't know they make humans this large and also I feel pathetically slow and next to this guy who weighs 320 pounds.

[00:31:16] **Dr Mike T Nelson:** Yeah. And to see a guy who weighs over three bills like move that fast. Like the first time I saw that I was like, what the fuck is it? Yeah. Because your perception is like big, huge, muscular guy and you, in my head I'm like, he's, but he's probably not that fast. And then you see him do drills and you're like, what the hell was that?

[00:31:35] Yeah, it is,

[00:31:36] **Evan Peikon:** it's freaky

[00:31:37] **Dr Mike T Nelson:** to see in person. Yeah. So going back to the device measurements so it looks like you can measure I wouldn't say blood flow, but SM O two, is that correct? Is that what you're actually looking at on the device, but just a much higher sampling rate? Yeah,

[00:31:51] **Evan Peikon:** so we measure s m O two, so muscle oxygenation and then the other biomarkers we measure one.

[00:31:58] It's active nitric oxide release from red blood cells. So we call that measurement p and o or personal nitric oxide, but it really is it's snow hemoglobin coming off of the red cell. In response to deoxy oxygenation, we also measure local muscle oxygen consumption. So if people are familiar with VO two, that's whole body oxygen consumption where measuring would effectively be like a local muscle VO two.

[00:32:23] Is that

[00:32:23] **Dr Mike T Nelson:** the you somehow are measuring what's coming in and what's going out, or how do you do that? I can't explain. Okay. Yeah. That proprietary, yeah, that

[00:32:33] **Evan Peikon:** gets into the ip no, that's cool. What I could effectively say is it's a local muscle oxygen consumption measurement, so the more you exert yourself, the more oxygen will be consumed in the tissue.

[00:32:43] Up to a point. You see very similar kinetics to. A VO two measurement where there's a ceiling on day to day you will see variations and within a given session you could even delineate in terms of VO O two based intensity zones, the same way that you could do a VO two max test and get like a easy, moderate, heavy, severe maximal zone.

[00:33:03] You could use u o two for that as well. And then we have a number of other measurements. We have internal training load measurements. We have things like skin temperature and accelerometry. So again, just some of the extra like nice to haves.

[00:33:16] **Dr Mike T Nelson:** So for the listeners, how would you explain the, kind of the VO two measurement versus SSM O two?

[00:33:23] So I think for people they're like, I dunno. They're both looking at oxygen, like what's the difference? Yeah,

[00:33:29] **Evan Peikon:** That's a great question. So I would explain SS O two is a dynamic balance between oxygen supply and demand. So if you see SS O two going down, that means more oxygen is being utilized than is being consumed.

[00:33:42] If you see SS O two going up, more oxygen is being supplied to the tissue than utilized and a

[00:33:47] **Dr Mike T Nelson:** flat. So SSM O two is more, you're using up more than what's actually being supplied, correct?

[00:33:53] **Evan Peikon:** And then U O two, which is a measure of oxygen consumption, it's how much is actually being consumed. So you could have a scenario, or SM two is completely flatlined because oxygen supply to the tissue is matching demand, right As O two totally flat, but u O two could be going up because the total oxygen fluxx is increasing.

[00:34:14] It's the difference between you were supplying five units of oxygen and utilizing five. Versus you're supplying 10 and utilizing 10 s. M O two would be flatlined in both of those cases, but that's actually a different amount of consumption. So that's where having both of those measurements would be useful there different ways of looking at the same system essentially.

[00:34:36] So

[00:34:37] **Dr Mike T Nelson:** could that be a surrogate for potentially blood flow then maybe. I know that's a loaded question.

[00:34:45] **Evan Peikon:** I'd say in a sense you could make some comparisons to blood flow. I think if we wanted to think about blood flow, I'd say the personal nitric oxide or P N O measurement would be more similar to blood flow.

[00:34:59] **Dr Mike T Nelson:** Yeah, that was my next question of that plays into, yeah,

[00:35:02] **Evan Peikon:** we're measuring in the microvasculature and. Active nitric oxide release from red blood cells is the principle regulator of microvascular blood flow. That's true in muscle. It's true in the heart. It's true in the brain. So we're essentially measuring like the key piece of that integrated system.

[00:35:20] So I wouldn't say that active nitric oxide release the measurement p n o, is blood flow because there are times when those measurements will be not match up related. There's also times where they'll be strongly correlated. So there, it's a useful analogy, but that analogy breaks under certain circumstances.

[00:35:39] **Dr Mike T Nelson:** Gotcha. And so what is the, for people listening, what is a huge advantage of trying to measure these markers of nitric oxide? Because the thing that always stuck out to me from my anatomy and physiology

1 0 1 was that the local control almost always override systemic control. To me, it's just fascinating to think about how the body is designed.

[00:35:59] If you just look at simple Sympathetic outputs of, let's say norepinephrine, right? The norepinephrine is gonna go throughout your entire body. It's gonna be carried in the bloodstream, but if I'm running from a bear when it hits muscle, it's gonna have a completely different effect than when it actually hits gut tissue.

[00:36:16] So it's a very cool way of the body saying, Ooh, here's this stressor thing that's happening, but we're gonna put out this sort of stress signal everywhere because we want to coordinate all these events. But that doesn't mean that the response is gonna be the same across all systems. That response could actually be completely 180 degrees different because the local control at any one point could override that and be like, Nope, nope, nope.

[00:36:41] This is what we're actually trying to do here. Yeah. So that always has been super fascinating to me.

[00:36:46] **Evan Peikon:** So that's something that's really interesting about this active nitric oxide is active nitric oxide. It is released in a local tissue, but it's long-lasting and active in blood. So it actually stays in the blood and circulates around the body.

[00:36:59] **Dr Mike T Nelson:** It does stay. Okay. I thought it was more fast acting, but I was wrong on that. Yeah. So

[00:37:03] **Evan Peikon:** this is where we're trying to figure out the proper terminology for getting this information out there. So in the fitness industry we talk about nitric oxide. Most people know no explode. Yeah. But generally it's like beet root, el citruline arginine in less of a direct way that is what I would call ordinary nitric oxide.

[00:37:24] So it's actually there's thousands of forms of nitric oxide in the body. Lots of different ways that they're produced. Physiologic effects. So the two most common that we know about is ordinary nitric oxide. In active nitric oxide is really snow hemoglobin. So if anyone's interested in learning more about that molecule specifically, you can look up S N o Hyen hb.

[00:37:46] So ordinary nitric oxide is released by the endothelial cells in response to stress. So earlier you're talking about flow mediated dilation. Yep. Cut off blood flow to a limb. You release all of the blood comes rushing back

in. It creates sheer stress on the vascular walls and the endothelial cells release ordinary nitric oxide.

[00:38:05] The same thing happens to a lesser degree during exercise as well. If you squeeze a muscle and contract really hard, you actually cut off your macrovascular blood flow, your release, you create sheer stress. That form of nitric oxide, it does increase bulk blood flow. Not oxygen delivery per se, and one of the main effects is to lower blood pressure, and it's also very short lasting in blood.

[00:38:30] So when that ordinary nitric oxide is released in blood, when a deoxygenated hemoglobin passes that ordinary nitric oxide, it scavenges it. So it sucks it up, and it carries it back through the systemic circulation. When that red blood cell containing hemoglobin makes it back to the lungs, what happens is it releases its carbon dioxide, which we breathe off and expels waste product.

[00:38:54] And then that hemoglobin picks up another electron and that ordinary nitric oxide unbinds from the heme iron center and hemoglobin and attaches onto a cysteine site, and now it transforms into s nitroso hemoglobin. Now it's the active form of nitric oxide. Then picks up the oxygen, pumped up the heart, and it goes to the rest of the body.

[00:39:15] So now that little red blood cell with the hemoglobin containing oxygen and active nitric oxide is. Traveling around the body. And when it comes to a tissue with a low oxygen supply, the red blood cell senses that in it releases the act of nitric oxide and oxygen. Oxygen eventually diffuses, makes it into the mitochondria for energy production.

[00:39:36] But that act of nitric oxide signals for the surrounding microvascular blood vessel to dilate. So the capillary specifically now more, red blood cells make it there. Eventually the oxygen supply and the tissue is sufficient. So now any red blood cells with active nitric oxide don't release it.

[00:39:53] So it's very much a supply and demand-based system. Oxygen levels are low, active, nitric oxide is released. If they're not, they won't be. Now that nitric oxide that's released in that local tissue ends up staying in the blood travels throughout the body and what it eventually does. It dilates the blood vessels in the heart and the brain.

[00:40:13] So one of the reasons why exercise improves CE blood flow is that active nitric oxide is a cerebral vasodilator. Now it's a slightly different mechanism for blood flow regulation in the brain because instead of being a

system that responds to low oxygen concentrations like the muscle, instead, it's a system that responds to high c o two levels.

[00:40:33] But generally it's the same mechanisms that are at play there. And the really interesting thing is when you have a mouse that is mutated to not carry active metric oxide in its blood, even when it has totally normal oxygen levels, it can't oxygenate its tissue because that active nitric oxide is also Responsible for allowing oxygen to dissociate from the hemoglobin in the red blood cell.

[00:41:00] So that process is thermodynamically coupled that when the active nitric oxide breaks off of hemoglobin, oxygen breaks off as well. If you don't have that active nitric oxide hemoglobin has a much higher affinity for oxygen and it's not as easy for the oxygen to come off. It causes a left shift in the dissociation curve.

[00:41:19] So people with low active nitric oxide may have normal oxygen levels as you would measure them with a pulse oximeter getting their arterial oxygenation, but they may actually have low oxygen delivery to their tissues. So one of the benefits of being able to measure someone's active nitric oxide levels is you know what oxygen supplied tissues looks like.

[00:41:38] The more active nitric oxide you have, generally the better your health, fitness and performance. And that's something that you could train to increase over time. And you could also see how it's trending over time to know if you are. Training program is getting that response. If that's something that someone is specifically looking to do, there would be a

[00:41:57] **Dr Mike T Nelson:** local tissue oxygenation marker then, so to speak, or a level, correct.

[00:42:03] Yeah. And

[00:42:03] **Evan Peikon:** that local aspect is really important for a number of reasons. But one is imagine a situation where you tore your a c

[00:42:11] **Dr Mike T Nelson:** L a year ago. Yeah, I was just thinking about injuries where you've got less blood flow or if you're comparing, I did, I tried to do this a little bit with Moxy. Compare left to right even at rest.

[00:42:20] Yeah. And rest I wasn't able to get some of the best data, but you would see weird shit where one side looked like the oxygen kind of kinetics, for

lack of a better word, even though I'm bastardizing that were different. And then you talk to, you're like, oh yeah, I had an injury on this left side and.

[00:42:36] I would do like some manual muscle testing and the right side would test different than the left side. And yeah, you just see some weird shit.

[00:42:43] **Evan Peikon:** And one of the reasons for that is yeah, when people tear their ACL l they always think about, you, you tear the tendon or you tear your quadricep muscle, people forget.

[00:42:52] You also tear your blood vessels too. They tear everything. Yeah, you tear everything. It's not the tendon. It's like you said. So typically when people are going through return to play process, they take a very muscle or tendon centric stance, but they're not thinking about also restoring the blood flow to the tissue.

[00:43:11] So years back, one of the things that I'd seen with Moxie is seeing these asymmetries that you're talking about between left and right. Yeah. And at the time I was like, how do we get better data on this? How do we expand this view? So one of the odd things that I started looking into is infrared thermography.

[00:43:28] The reason that I'd gotten interested in that is I was reading about racehorse physiology and one of the things that was interesting is they're like how do you know if a racehorse is injured? It can't tell you. So figure out ways to work around that problem. And one of the ways that people start figuring out is using infrared thermography to essentially take a heat map of the tissue.

[00:43:47] And I was like, oh, that looks pretty cool. I bet you could do that in people too. Around that time the company, Thermo Human was also starting to pick up as well, so I talked to some of the scientists from there, asked them what they were working on, tried to, get as much information as I could.

[00:44:02] So now I went back to, at the time I was working at Training Think Tank, and we would have someone that would have had a previous knee injury and you would see that they would have impaired oxygen utilization in that tissue. Then lo and behold, when you use infrared thermography, you would see like a big blue spot.

[00:44:18] On the tissue, which blue and infrared thermography is generally a colder measurement. So you're like, oh, they have a big hypothermic region in this tissue. You look at their tissue temperature as well, and it's lower. It's

because they've impaired blood flow to that muscle. So you see this with the NOx device as well.

[00:44:33] One, we do have a temperature measurement in the device, but you'll also see that people generally have low active nitric oxide release in tissues that were previously injured. Properly rehabbed. As the tissue recovers over time, you start to see those asymmetries going away. So that's one of the important components is yes, active nitric oxide is released in the local tissue and it travels systemically.

[00:44:56] But that localized measurement is important so far is if you imagine a hypothetical world where you only wanna exercise one leg each day and. You have one leg that was previously injured, the other leg that isn't, and they're doing the same exercise routine, alternating days. And those days that you're working out that leg that was previously injured, it's not gonna have as much active nitric oxide release.

[00:45:19] So there are non-trivial reasons why you really need to rehab tissues properly. Aside from the fact that you want to get stronger again and not be in pain, you also need to restore blood flow. So you could produce active nitric oxide or any other myokine in that tissue that's gonna have a positive health effect.

[00:45:39] **Dr Mike T Nelson:** Oh, that's super cool. And for fun, I do actually love reading racehorse physiology because one, most of those people time everything. Two, the horses don't have much placebo. And then three, like you said, you can't ask the horse, how do you feel today? What's going on? So you're kinda left with, and most of the people doing that have a lot of money and Yeah, drug testing and all that stuff is usually there for most of it too, so they're trying to find ways around things via performance, and again, doesn't always translate to humans, but, sometimes you come up with like you were saying with thermography and some other cool things that are interesting to think about. Yeah.

[00:46:20] **Evan Peikon:** At least from a tool standpoint. Yeah. Physiology doesn't always transfer, but at least from a tool standpoint of seeing what are some tools that other people are using and, yeah, I use those too.

[00:46:29] Sometimes the answer is no, but oftentimes you end up stumbling on some kind of neat stuff. Have you

[00:46:35] **Dr Mike T Nelson:** played with just any manual muscle testing to see if the area that had less profusion, quote unquote tested weaker? I know I'm gonna piss off a whole bunch of scientists, but even mentioned manual muscle testing and they're gonna send me hate mail again, but,

[00:46:48] **Evan Peikon:** No, I haven't done that specifically.

[00:46:50] Just because I don't have any experience with that, so I wouldn't know what I'm doing. Yeah.

[00:46:56] **Dr Mike T Nelson:** That one thing I've noticed is, again, it's anecdotal, is that in general, what I'll notice is that side just, it's almost I don't wanna say it's shut down from the nervous system, but it just doesn't function as well.

[00:47:07] And you can even have people do functional tests, right? Yeah. You can have 'em do a squat and look at, okay, oh, do you always shift your hips to the right when you do a squat? Oh my god, how did you know? Yeah. Because your left side's weaker you're putting force into the leg that your brain thinks is stronger.

[00:47:20] So of course you're gonna, on a, bilateral exercise, you're gonna move that direction towards your strong side, so it makes sense there.

[00:47:28] **Evan Peikon:** Yeah. Things like that always make me think of this issue of can someone not do something or will they not do something? Even using mirror, sometimes you'll see if you're doing like bilateral squatting, you're like, oh, your oxygen utilization is completely asymmetrical between sides, let's say the right side.

[00:47:42] Yeah. Keep in mind there's some normal asymmetry, like a 5% difference between sides, probably not meaningful. But if it's like a 35, 40% difference and the sensors are actually in the same spot on each side, you're like, ah, that's a little fishy. So if one side isn't utilizing as well, you're like, are you actually incapable of utilizing in that tissue, i e, all things being equal?

[00:48:04] Will that tissue not suck down oxygen, or is it that you will not do it? As in you're either protecting that tissue for some reason, you have some kind of faulty movement mechanics. So I think that's another interesting dimension as well, of combining these like external measurements or even just visualization looking at an athlete.

[00:48:23] It's hard to replace a coach with a good eye with some of these internal measurements and being able to combine those to see well. Maybe we know that this athlete is asymmetrical. Is it a local tissue problem? Is it more of a top-down movement coordination problem? And being able to triangulate with that as well.

[00:48:40] I think that gives coaches a lot of tools for selecting which tactics do I use right now with this person? So I think that's something kind of fun to play around with as well. I don't really coach people one-on-one anymore, but that's something I definitely wanna spend more time looking into.

[00:48:56] **Dr Mike T Nelson:** Yeah. And you mentioned, so I've done a fair amount of work on hands-on stuff with intermediate ish level CrossFit athlete, a couple that were a little bit more highly ranked and exactly what you said 90 plus percent of the intermediate level ones are just like, you look at 'em and you're like, oh, it looks like you're gonna do a photo shoot.

[00:49:17] And you push on the muscle and it's just, it's super tense. But when you do a lot of the testing, it actually paradoxically tests, quote unquote weak. And. So my big thing with them was, okay then when we have you do a motion, can we get the muscle to fire as best that it can? And when you're lying there at rest, can I get some more of this toned back where I don't hit your quad and it looks like I can bounce quarters off of it?

[00:49:41] Which ironically, two of the, they're female athletes at the time they were mad that they didn't look as good in their static postures, but their CrossFit times all went up and they were mad at me. That's, and I'm like, okay, but you came 'cause you wanted more performance. They're like, oh, but my abs don't look as defined when I'm like just contract your abs and if you want a better picture, yeah, I don't think you wanna walk around with that much attention day to day.

[00:50:04] I don't think anything good's gonna come out of it.

[00:50:07] **Evan Peikon:** We had a really good manual therapist at a gym. I worked that years back. This was at training Think Tank when I'd worked with a lot of those top CrossFit games competitors. And he had made an offhand comment one day that he's like, when you're working with the best CrossFitters.

[00:50:20] He's they are like hiddens where if you ever see a cat they could jump really high there fast. Yeah. Poke a cat's muscle bellies and you're like, oh, it's just like a bag of warm milk. Yeah. There's this low tension there. And even

he was saying some of the CrossFit games athletes that look really muscular and you'd imagine if you know you poke them, it's gonna hurt your finger.

[00:50:39] He's they have no tension. You could just grab their arm and put it behind their head and twist them in weird ways and it doesn't hurt them. Yeah. I'm like, huh. It's interesting. It makes me wonder if it's almost like a survival advantage to get to the top of that sport. 'cause they're accruing so so much less mechanical damage in their day-to-day life as an athlete when they could be very relaxed versus the athletes who are like the strongest CrossFitters.

[00:51:06] You typically see that they get to a top level relatively quick, but they never really last for more than one or two seasons. They always end up blowing their backs out. Yeah, they break. Yeah, they tear a peck really easily. And the people at the top of the sport, they're really never the strongest CrossFit competitors.

[00:51:22] Barring maybe on the female side, you often see that like a podium finisher will be the strongest athletes. There's also slightly different selection criteria for males and females and cross, at

[00:51:34] **Dr Mike T Nelson:** least right now. Yeah. Justin, Kevin, I was talking about that too, like on some of his top sprinters and athletes.

[00:51:40] He is like I, he is you can tell right away by just the tissue quality and then watching them move and then back to what we were talking about with blood flow. My hypothesis is maybe those top CrossFit athletes, maybe it was Todd, maybe it was intrinsic. Who knows? Maybe it's from bazillions of reps if their brain figured it out.

[00:51:57] But again, if you can get that muscle to relax faster, Especially in something like CrossFit, that's a more met con based sport, then you can get oxygen back, you can get blood flow back to the tissue and that would probably confer you a big advantage, especially in, longer events where the more oxygen you can get to that tissue, the more it turns into this endurance grind to finish it.

[00:52:20] **Evan Peikon:** Yeah, and that makes a lot of sense to me. I also remember at one point again, working at Training Think Tank, we had about like 10 top male CrossFit games competitors there for training camp. And one day someone just decided let's just have them do like a verta max, like max height jump test. Oh, nice.

[00:52:37] And one of the most hilarious things, I won't throw anyone under the bus, but this was a guy who was a podium games finisher the year before.

[00:52:44] **Dr Mike T Nelson:** Was it terrible? So

[00:52:48] **Evan Peikon:** I'll explain what the form looked like and then you tell me if you think it was squatted all the way down to the ground. Oh no. And then jumped up, maybe got three and a half inches off the floor.

[00:53:02] What is going on there? Like he just couldn't find a spot of tension in order to explode up where a few of the other guys there. I'd say more of like back of the pack games, competitors obviously exceptionally fit people, but Oh, totally Talking there's a difference between being top five at the games and being in 25th place.

[00:53:20] Yeah, these guys were jumping incredibly high, but they were also, again, much stronger athletes back at the pack. And they made it one or two seasons at that level before eventually getting injured. So even there, you're seeing some of these Kinda like loose correlations of huh, people that aren't super explosive, can't really find a spot to generate maximal tension, tend to make it, I mean that athlete has probably been competing at a top level for maybe eight to 10 years now.

[00:53:48] Yeah. That's a long time. CrossFit. Yeah. Very long time for that sport. The really powerful, super explosive guys, again, one to three year careers, unless they could occasionally figure out a way to reverse that. And oftentimes that's like a two to three year process of not competing and starting from square one to be able to build back again.

[00:54:09] **Dr Mike T Nelson:** Yeah. And that matches. It's another buddy of mine who's a coach, he is worked with college athletes and a lot of pros in the N H L and he was telling me that he is yeah, you get some of these, he calls 'em the sympathetic monsters who come into the N H L and just dominate for one or two years and then literally are gone and nobody ever hears from 'em again.

[00:54:27] And he is most of the time they just get injured, burnt out, whatever. He's like the guys who can play, five, eight, sometimes 10 years, a decade or longer at a high level. He is they're on when they need to be on and they are completely off when they need to be off. Because I was doing work on one of the athletes over at his place, and it's some pretty intense, hands-on work.

[00:54:48] We're doing some dolphins, some STEM stuff on him. The guy like falls asleep on the table as we're working on him, which almost never happens. Yeah. But the second you had him do a task, we had him do some visual tracking stuff where okay, we want you to do this drill. We explained what it was like. He was 100%, he looked like he went from taking a nap to a hundred percent on and like just destroyed the task.

[00:55:08] Like we could only get his eyes to make one error. And we went back to do it again. And he had subconsciously corrected the movement pattern. Wow. So I looked at a buddy of mine. I'm like, did you see that? He's holy shit. And we asked him, we were like, do you know what you just did? He is like, No, he had no idea.

[00:55:26] Yeah. He brain figured out he made an error. By the time we did the second pass, he had already subconsciously corrected it. Wow. So to me it was just fascinating how you've got ability to make transitions, but yet that skill or that idea, at least in, the US isn't really taught to athletes.

[00:55:44] It's like performance at all costs. And then we will worry about the cost later.

[00:55:49] **Evan Peikon:** And I wonder how much of it is trainable in the first, I don't know. I wonder if everyone was taught that, would you still see it shake out the same way anyway? I'd imagine, some more people would probably be performing in that way, but I wonder if that is something that's trainable.

[00:56:03] It's, it's hard to give it heads or tails either way right now.

[00:56:09] **Dr Mike T Nelson:** Yeah. We've done some stuff with R P R reflexive Performance Reset, and at least in terms of tools, that seems to be the best thing I found for it. But, And again, it even goes back to, training. Did they just subconsciously figure it out?

[00:56:22] Were they taught that? Yeah. Cool. Why, as we wrap up, like what is the use of the device for people looking? 'cause we started looking at okay, we can maybe individualize training now. Like how would people use this device? How do they put it on? And what would be some of the data that's useful for them to change their training?

[00:56:41] **Evan Peikon:** Yeah, totally. So it's an end-to-end solution. So the device you put it on, like a lot of other wearables, it comes with a, like a universal strap that you could put on like a quadricep upper limb. But we

typically tell people is if you have more of a unconventional use for it, you wanna put on a collateral Delta Ladd, you could use an adhesive for that,

[00:56:59] **Dr Mike T Nelson:** So it's pretty small, right?

[00:57:00] For listeners, like how big is it?

[00:57:02] **Evan Peikon:** Yeah, so it's about a thumb size. So you of, oh, it's tiny. Yeah. Not ginormous hands. Not a huge guy. So the size of my thumb. So it's a pretty small device. It's like a U S B stick size, so you could put it on most muscles and it's an end 10 solution. So when you use it, it streams all the data to a mobile phone in live time.

[00:57:22] So if you're working out, you could see your active metric oxide levels and your muscle oxygen consumption and your muscle oxygenation.

[00:57:30] **Dr Mike T Nelson:** You can see that live on your phone and just be a Bluetooth then, I

[00:57:32] **Evan Peikon:** assume? Yep, exactly. Cool. And we tell people if that's one way to use it and interact with it. If you know exactly what you want from the data and you could make adjustments on the fly, have at it after you finish a workout, press, send workout on your phone.

[00:57:45] If you're called NOx one elite user, it's a second tier up. All of that data automatically comes into a platform online. It's a pretty robust analysis platform. So you could get your workout view and you could comb through the data, combine any of the biomarker measurements, you could compare that data to other workouts that you've done.

[00:58:03] You could see your trends over time. So we've added a lot of features in there, essentially thinking. What things might the coach want to do with this platform? And then we build it in, because it is a subscription model, we're able to continually add new features in there. What I will say is just in the mobile app itself, there is another feature in there as well.

[00:58:23] We call it the AI coach. This is probably less for the high performance users and more for maybe someone that's I wanna increase my active metric oxide levels. I know nothing about training or Sure whatsoever. So the way that this works is you strap the device on, you say what modality you wanna do, picking between cyclic options.

[00:58:43] So I want a bike, we're on elliptical row, you name it. Tell us how long you wanna workout in Fresco. And what the AI coach does is it reads your biomarker levels in real time and it guides you through a workout. So it's like having a spin coach there telling you go fast or go slow, or that type of thing.

[00:58:58] But it's making those adjustments based on your own biomarker levels. So what it tries to do for that workout period, whatever time you select, It's gonna alternate between higher and lower intensity bouts, knowing that the high exertions are what are going to cause the most active nitric oxide release in the tissue.

[00:59:14] But you can't just crush yourself with high intensity, right? You will essentially deplete your snow in that tissue.

[00:59:20] **Dr Mike T Nelson:** You can't do that all the time, man. That's not what the internet told me.

[00:59:24] **Evan Peikon:** Yeah. Shoot 20 tabatas in a row and Right. Perfect. Every day. So essentially what it's trying to do is it's trying to balance that intensity and recovery with whatever period that you exercise for, and it's making adjustments in real time.

[00:59:39] So there's different ways of interacting with both the mobile app and the online platform. And then we have another tier of offerings, which is really only for like sports teams and military, and that's a team specific platform that has more features in there. And it's more geared for the types of analysis that you would want to do if you had a crew of 30 people and you were wanting to look at all of their data and compare things like that.

[01:00:03] **Dr Mike T Nelson:** Cool. And what is the rough price point?

[01:00:06] **Evan Peikon:** So the device itself is $300 USD and the subscriptions range from 20 to $60 a month for people. Teams have their own, custom price points, that's a you or coach for professional sports team. And that's gonna depend on like customizations and features and things like that.

[01:00:28] **Dr Mike T Nelson:** Awesome. And could people put more than one sensor on if they wanted to get crazy then? Or is it just one sensor right now?

[01:00:34] **Evan Peikon:** So for right now, it's just one. So someone wanted to buy a device. When you buy a device right now, you buy it with a subscription

and that's because right now the mobile app only allows you to sync one device a few months after launch.

[01:00:48] We're gonna remove that constraint and NOx one Elite users will be able to sync multiple devices to a single phone. Oh, nice. And point people just be able to go on the website and buy a device without it being associated with a subscription.

[01:01:02] **Dr Mike T Nelson:** Very cool. Awesome. And have you noticed any of the supplements to increase blood flow?

[01:01:09] Do they do anything? What I'll say is in my, you don't have to name brands, but yeah.

[01:01:15] **Evan Peikon:** In my limited experience looking at this, I have not seen that any of those supplements impact your active nitric oxide levels in any way. That said, n of one, probably not high enough doses in many cases. Also not knowing exactly what is in a lot of these supplements 'cause, proprietary ingredients.

[01:01:34] So it's quite possible the right combination of ingredients and correct doses for the correct person will have an effect. But, it stands to tell.

[01:01:43] **Dr Mike T Nelson:** But someone could do their own experiments now, right? Because they've actually got an active endpoint instead of, I don't know, bro. I felt like I got a better pump.

[01:01:51] Exactly.

[01:01:51] **Evan Peikon:** And this is where the interesting thing is even trying to figure out what would be the timescale that we would see these effects? Because knowing that when you take, could be root supplement increases the plasma nitrate concentrations, which in theory should end up increasing nitric oxide, but that's increasing ordinary nitric oxide, which still needs to be metabolized and turned into active nitric oxide.

[01:02:14] So I don't know what the time skills look like from when you're ingesting something like a bee root supplement. When does that actual bee root that you ingested end up getting converted into nitrate to nitric oxide to active nitric oxide? I actually don't know the answer to that, but I suspect it's not within that session.

[01:02:34] So there might even be something to like continuous dosing, things like that. So there's gonna be a lot to experiment with. I think that's part of the fun of it as well. That's something I really loved about the Moxie community for years, is it's just a bunch of people trying things out and talking about what

[01:02:50] **Dr Mike T Nelson:** they see.

[01:02:52] Yeah. And if people are using nitrates, don't use mouthwash because it will kill the enzyme that you need to con convert it. So just they just saved you $30 in your beet root supplements or whatever. Yeah.

[01:03:04] **Evan Peikon:** Bother lister either.

[01:03:07] **Dr Mike T Nelson:** Great and completely off topic. But I think you like some good metal music, is that correct?

[01:03:12] Did I hear the rumors correct? Like myself,

[01:03:15] **Evan Peikon:** some hardcore music. Any

[01:03:16] **Dr Mike T Nelson:** top favorites?

[01:03:19] **Evan Peikon:** Ooh, I, I do change a sala right now. I've been listening to a lot of Norma Jean, which is okay. Yeah. Two thousands. Yeah. And American hardcore bands. That's definitely one of my favorites. I always come back to them.

[01:03:31] Any other favorites? I know. You were an August Burns red fan. Am I right? Oh, I love August Burns Red. Yeah. Yeah. I always do some mugs, burns Red. Been listening to a lot of post hardcore, like glass johns and bands like that from the mid two thousands. So I have a cutoff.

[01:03:50] Anything that comes after 2008 to 10 heard it. The only newer hardcore band that I've gotten really into in recent years is Knocked Loose. Yeah, they're pretty good. Yeah. I do like their music a lot. It has a very old school feel.

[01:04:04] **Dr Mike T Nelson:** Yeah. Yeah. There's another Texas band called Ubon that's metal hardcore.

[01:04:09] The first couple times I heard it, I was like, I don't know, and then I heard 'em the other day. I was like, whoa, this is actually really good.

[01:04:14] **Evan Peikon:** I actually saw them, it was a club in Atlanta a few years ago. Oh, did you? Yeah, they opened for Norma Jean on a tour. Oh wow. It was a pretty cool show. 'cause that was like a hometown show for Norma Jean.

[01:04:26] Another more one silent plan that I like a lot. It's similar vibes, like a kan or a nacal loose.

[01:04:32] **Dr Mike T Nelson:** Nice. And then early haste the day is also very good in that kind of genre. That's great. Yeah. Awesome. And so where can people find more about the device? Where should they go? Best website. And then if you wanna be found anywhere, I know you've got some good stuff on your Instagram all the time too.

[01:04:48] **Evan Peikon:** Yeah, so the found the device, the company's called Knoxx, so it's N O X just knoxx.com. Knox one.com could also just Google Knox. I don't, I think if you Google it, the only other thing that comes up is there someone that plays World of Warcraft and their name is Knox. So we'll follow that person too.

[01:05:07] And then to find what I'm doing just, Google, my name Evan Peikon. There's only one of me in the world, so I'm pretty easy to track down.

[01:05:15] **Dr Mike T Nelson:** Awesome. Thank you so much for all your time here and really appreciate it. And I think the device will be super. Interesting for people to run their own experiments too.

[01:05:23] 'cause as we talked about, it's good I think to understand the principles of how stuff works. And then the next level down is how can you get some of your own data to, to look at it and see what's actually going on, which can allow you to be more efficient and have better outcomes then too.

[01:05:39] **Evan Peikon:** Yeah, absolutely.

[01:05:39] And thanks for having me on. This was great.

[01:05:41] **Dr Mike T Nelson:** Yeah, no problem. Thank you so much. Appreciate it.

[01:05:46] **Dr Mike T Nelson:** Thank you so much for listening to the podcast here. Really appreciate it.

[01:05:50] Huge thanks to Evan for coming on the podcast here once again. Always enjoy talking to him. Always learn something new. Make sure to check out the NOx device. You can go to n o xx.com. I don't have any disclosures with them, but I've known Evan for a while. I followed his stuff, been able to chat with him many times.

[01:06:11] And like I said, I always learn something new about physiology and so I wanted to have him on here and support him in his new endeavor. And it looks super interesting, so I'm excited to. Check it out myself. So make sure to check out his stuff there. And if you enjoy this geeky chat, check out my newsletter.

[01:06:32] You can get it@miketnelson.com. It's free. It goes right to your inbox. We've got all sorts of snippets on how to increase muscle, better your performance, improve body composition, and do it all without destroying your health in the process. So go to mike t nelson.com. Again, big thanks to Evan. Make sure to check out all the links and everything from him below.

[01:06:57] And if you do pick up one of the devices and you're using it let me know how it goes. I'm pretty excited to, to check it out to myself. And as always, if you can leave us a short review or whatever stars you feel is appropriate, pass us along to someone you think may enjoy it. Really appreciate that.

[01:07:14] That really helps the podcast and helps. I get better distribution with the old algorithms so that more people can be better overall. Thanks to Evan. Thank you for listening. I really appreciate it. I'll talk to all of you next week.