

Enhance Your Physical & Mental Resilience (HRV, Respiratory Rate, RHR)

Perform with Dr. Andy Galpin · Episode 21 · April 16, 2025 · Transcript

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Dr. Andy Galpin

The science and practice of enhancing human performance for sport, play, and life.

Welcome to Perform. I'm Dr. Andy Galpin. I'm a professor and scientist and the executive director of the Human Performance Center at Parker University. And today we're going to be talking about how to control your nervous system.

My favorite example of this actually comes from a TV show. Many of you probably remember the show *The Office*, at least the American version. And I'll never forget one of the classic scenes, one of the characters, Dwight Schrute, was telling and bragging actually about how he had superior genes, and he was able to, at his own will, raise his blood cholesterol levels.

And of course, the bewildered friends of his asked him, why would you even want to do that? And his response in classic Dwight fashion was, so that he could lower his cholesterol. That had made me laugh, and I've never stopped laughing at that. And it highlights one example, albeit, admittedly, not sure why you would want to do that, or if that's real or not. But it highlights the point of, how can we actually have control over aspects of our physiology that most people think we can't?

Maybe we have some control, but it's subconscious or otherwise. And that's what I'm referring to when I say control your nervous system. There is actually a bunch of science behind this. Probably the most famous initial scientifically documented experiment came in 1970. There was a famous gentleman, I think his name is Swami Rama. I hope I pronounced that appropriately. But Swami was able to do a host of feats that still baffle most of us.

What eventually happened was he sat in a room with a handful of scientists, and they placed what are called ECGs to measure electrical conductivity of his heart, as well as EEGs to measure directly into his brain. And he performed again this whole host of insane physiological feats without moving. Now that part's critical, right?

So when he did things like take his resting heart rate from 70 beats per minute to reportedly 300 beats per minute, and he held that for several seconds and then brought it back down, he did

that not by running sprints up a hill or anything, but by just simply sitting there and having the conscious ability to control that aspect of his physiology.

Another really impressive thing Swami was able to do was actually shock the scientific team. They thought he was in cardiac arrest because his ECG stopped working. And what happened was he was able to bring his heart rate below 20 beats per minute at the same time, give himself what's called AFib. And so the machine itself thought his heart had been stopped for like 20 seconds. I guess he signaled that, you know, I'm fine, I'm OK here. And then eventually brought it back up.

Arguably more impressive was some of the stuff he was able to do with his physical temperature. So they had him on the same hand change the temperature by, I think, like six degrees Celsius in his same hand, again, only inches away. And so clearly demonstrating some, not only control of his whole body temperature, but extreme precision of where that temperature was going and where it was not. But nonetheless, that was documented and published. And again, to this day is probably one of the more famous cases of such incredible control of one's, what's supposed to be, autonomic physiology.

A decade later, and I'm going to highlight this one as well, I think it was 1982 actually, a similar thing was done in a more extensive group. And so what actually happened here was a paper was published in Nature. Now, that's one of the most blue ribbon highest esteemed journals in all of science and physiology. And so, preeminent journal, it was published, and they looked at a bunch of Tibetan monks that lived in the Himalayas, studying and utilizing a practice that's called TUMO, T-U-M-M-O.

And they were able to do a bunch of similar things that Swami was able to do. I won't draw them out, but temperature controls, raising their body temperatures by like eight degrees consciously without moving. In fact, one of the things that they did was them, they put wet sheets on top of them and put them in very cold, if not sub-zero conditions. And these individuals were able to not only stay neutral with temperature, stay neutral with their heart rate, but they were also able to physically dry the sheets within like 30 to 60 minutes.

And so, you can go on and on, you can probably find many other case studies like this, and again, thousands of anecdotes and other stories throughout history. But I think one thing that I'm trying to highlight here that is inarguable. There is clearly the ability to run control over your physiology if you really take the time and attention. Is it tummo? Is it visualization? Well, probably, realistically, we've got tons of different options.

And so, what I'd like to do today is talk about just a few of them. What do we know? What does it mean to control your nervous system? What can we do? What can't we do? And then what are a

bunch of tactics and strategies so that you can have a more resilient nervous system?

To start us off, I want to make sure we're all on the same page when I say nervous system. The easiest way to conceptualize it is think about it in two large branches. The first is what's called the central nervous system. This is your brain and brain stem and spinal cord. And the second is what's called your peripheral nervous system. So this is everything else that goes out and comes back to the central nervous system.

Now focusing on the peripheral nervous system, that's where most of the action happens. In this case, the peripheral nervous system is broken up into a couple of other categories, one being what's called the somatic system. This is what you can actively control. We're not going to talk about that much today. It's stuff you already know you have control over. What I want to focus more on is the other branch, and that's what's called the autonomic nervous system, the ANS.

And so within the autonomic nervous system, we're talking about things like the parasympathetic system. You may have heard of that as rest and digest. There are probably better ways we can describe it, and more interesting applications of it, but nonetheless, we'll just keep it simple right now and say that the parasympathetic is rest and digest. You also have the sympathetic, that is your fight and flight. And so most of us stop right there, and we think, OK, parasympathetic, I'm relaxed, I'm lethargic, I'm down, I'm chill, I'm zen. Sympathetic, I'm fight, I'm flight, I'm up, I'm focused, I'm aroused, and so on and so forth.

Reality of it is, there's probably more things, like the freeze mechanism. There's also the enteric system that happens here. This is kind of like most specifically referring to your gut. But for the most part, again, for the sake of time, we're going to focus on the interplay between the parasympathetic and sympathetic nervous system, because that provides us the ability to have a lot of control over what our nervous system is doing. And as I'll show here very soon, that has a significant impact on how you're looking, feeling and performing in the short and long term.

And I'm highlighting that because, again, people don't necessarily realize how much control they actually have over those systems. They are autonomic, but you have the ability to move them up and down. You can recalibrate them and you can consciously, critically control them as I've given many examples of already.

If we were to zoom all the way out, focusing on that autonomic nervous system, the ultimate goal is to not have too much time and attention spent on this thing. If it is firing and functioning appropriately, it's running in the background. It is the software that's running your computer. You don't need to be worrying about it. It's making your life easier and better, but you shouldn't spend a lot of conscious control over it.

That said, sometimes it gets a little bit out of whack, and you want to have the ability to toggle it and recalibrate it so that you can bring it up or back down based on a particular thing you're trying to do. And so all we're talking about really in today's episode is what happens when it gets again out of whack or is not as finely tuned to a particular thing that you'd like and what can you do about it. That is ultimately today's version of controlling your nervous system.

Now, to be really clear, because we could go in a lot of different areas here, I'm also going to qualify this talk even further. We're not going to be talking about stress management, emotions, or even really mental health. In fact, I would encourage you to go listen to a recent episode of the Huberman Lab podcast, one of the ones that's in the Essentials catalog, where they break down a bunch of different tools and tactics on overall stress management and neurological control. I'm not going to cover any of those things today. We're going an entirely separate route.

I'm also not only talking about downregulation. I know personally for many years, I had this connotation whenever I thought about parasympathetic or recovery or relaxing. I just always, or breathwork for that matter, I just always thought it's all about down, down, down, down, down, and it's not. In fact, I'm not only going to focus exclusively on breathwork today either. We're going to go well past those things. What I really want to get at is, again, fine-tuned control. The ability to go down, but also go back up, and making sure that system is functioning how you'd like it to function.

So what we will talk about are, of course, the three I's. If you're new to the show, what that means is how to investigate it, how to measure your nervous system, what that even means, what you should look for. The second I is interpret. So how do you make sense of, how do you judge or evaluate that information that you got from that previous test? And then the third one, which is intervene. What do you do about it? What are protocols? What are tools and technologies? What are things you can do at home? What are things that can be done at a higher level that will make those positive impacts no matter which direction you're going?

So that overall is our game plan today. Talk about how we can control our nervous system in all those forms and fashion.

Today's episode is sponsored by AG1. AG1 is a vitamin mineral drink with probiotics, prebiotics and adaptogens. Initially, I was extremely skeptical of AG1, as I am with all supplement companies. But after months of discussions with their lead nutrition scientist and the general team at AG1, I've been impressed by AG1's commitment to sourcing the highest quality ingredients and constantly updating their formulas to have the right ingredients in the optimal amounts.

By now, it is abundantly clear that the gut microbiome plays a critical role in everything from

body composition to bone health to mental health. And the probiotics and prebiotics in AG1 help to promote a healthy gut microbiome, improve digestion, reduce food cravings and increase short-chain fatty acids, which play a critical role in regulating metabolism and immune responses. It's for these reasons and many others that I personally take AG1 almost every day.

Now, it's of course not a replacement for eating whole healthy foods, but it is a great way to make sure that you're plugging in any gaps in your nutrition to improve your energy, bolster your immune system, and just generally help promote a healthy gut microbiome and more. If you'd like to try AG1, you can go to drinkag1.com/perform to receive five free travel packs plus a year supply of vitamin D3 plus K2. Again, that's drinkag1.com/perform to receive five free travel packs plus a year supply of vitamin D3 plus K2.

Today's episode is also sponsored by David. David makes protein bars unlike any I have ever encountered. They have an amazing 28 grams of protein, only 150 calories and zero grams of sugar. That's right, 28 grams of protein and 75% of its calories come from that protein. This is 50% higher than the next closest protein bar. Honestly, it's the best tasting protein bar I've had by a mile.

While I often talk about the importance of getting one gram of protein per pound of body weight for things like muscle health and recovery and the promotion of lean body mass and satiety, the reality is that for most people, getting that one gram of protein per pound of body weight is really challenging. However, David makes that easy. Their bars taste incredible and are each packed with 28 grams of protein. I eat one almost every day and always have two or three in my backpack when I'm traveling, like literally always. It probably sounds funny, but I eat them as dessert all the time. When you try them, you'll know exactly what I mean.

The macronutrients one more time are 28 grams of protein, 150 calories and zero grams of sugar. If you're interested in trying these bars for yourself, you can go to davidprotein.com/perform. Again, that's davidprotein.com/perform.

So to start us off, let's remember the ultimate goal. We would like number one, that system to be operating independent of us. We want it to be that software that's running. And then two, we want to have some active control over it when we'd like. But we don't want to be spending our entire day mitigating and managing what's going on in our nervous system. So that goal is important because it lays the foundation of what we're trying to do.

And so really, you can bucket control of the system into two main areas. Number one is what we simply call read. All right. You need to be able to read your current state. You can use this with technology. So you can buy something or use something that tells you what's happening in your own internal physiology. Or you can learn what's called an interoception or interoception, which

means you can feel it yourself. Now, some people are really good at that. Some people are completely terrible at it. But either way, we've got to figure out what you where you currently are.

The second step is to regulate. So know where I'm at. Number one, number two, move it. And when I say regulate, I'm going to break today's discussion up into two parts, what I call acute things that move it right now. So you're feeling flustered right now. What can you do about it in this second? Are you feeling tired right now? You're losing focus right now. What are tips and tricks we can do that will instantly change my state?

And then the chronic ones are ones I refer to of what are going to move the baseline permanently. Where we get confusion or oftentimes, people that have tried things like this, where they've maybe been disappointed in the past is they're using things that are an acute stimuli and hoping it makes a chronic or permanent change. I'm really hopeful by the end of today's talk that you'll understand the difference and you can use the ones in the right form and fashion appropriately. But that's what we're after.

In either case, what we're really trying to do is make sure that we're widening the range of our sympathetic and parasympathetic experience rather than sensitizing it. What do I mean by that? It's not about just reducing stress. It's not about just down regulating. It's the opposite. In fact, maybe not the opposite, but it is complementary.

The analogy I like to give here is imagine driving down a road and you're going down a one-lane highway. It's very likely for you to hit the guardrails on one side of the road when another car comes by because there's just not a lot of room to work. But if you expanded that highway from a one-lane road to a seven-lane road, you're far less likely to hit the guardrails. That's what I mean. When we become overly sensitized to the down regulation or the up regulation, we're driving on a one-lane highway.

We want to not only become better drivers, right? I want you to have more control so you're not weaving as much. That alone will help you reduce your likelihood of hitting the wall. But mostly what we're after is widening out that lane, giving you seven lanes so that when you do lose a little bit of control, you can feel it, see it, but you're not smashing up against walls. When I teach this, I like to use that highway analogy.

That said, if you were to look at the research or talk to clinicians that work in this space, you're generally going to see it describe more as resilience. And what that means is you have the ability to experience high and low levels of changes in your autonomic nervous system without it having a dramatic impact on your lived experience, whether this is your psychology, your happiness, your anxiety, your depression, your perceived stress load, or your actual physiology, your hormone health, your energy, your metabolism, your sleep, your recovery, your physical

performance.

We want you to all to be able to live a life that is your best, meaning you can handle things that challenge and change your body from a psychological perspective or a physiological perspective. And those things don't have dramatic consequences for you in the short or long term. So I feel comfortable in saying that most of us are better off with a more resilient rather than sensitive nervous system.

What does that technically and practically look like? I will give you some tangible examples a little bit later. But one thing you want to think about here is, if you are somebody who feels like you are on constant sympathetic drive, you work out really hard at high intensity, you have a high stress personal life, a high stress place that you live, personal experiences, jobs, so on and so forth, then you might need to just focus on down regulation. That's fine.

We have hundreds of randomized controlled trials on people only doing down regulation work and it creating tons of positive experiences in their life. We've done this a bunch in my coaching programs. I've done this with my clients and athletes. No question that works there. But that's a little bit different and not always the best scenario when somebody is having issues on both sides, up regulation and down regulation.

Because what can happen is if you're only ever paying attention to that down regulation size, that highway starts to get smaller. All right, so what you probably want to do, and if you actually look at the research in this space more carefully, a lot of the interventions strategically implement both up regulation and down regulation. Even if somebody is highly stressed, has a lot of anxiety or has other markers of overall dysfunction or problems in the nervous system, you're going to see careful integration of both up regulation and down regulation.

And that's because it works like a hormetic stressor. I've talked about this for many, many years as one of my favorite things to talk about. But effectively, what you're doing is you want yourself to down regulate. Well just telling yourself to calm down doesn't always work very well.

Sometimes the easiest way to calm down is to actually give yourself a supercharge up so that your body naturally swings back down as an equal and opposite reaction and the other way. So that is the framework with what we're going to talk about.

Well let's get right into how we measure our nervous system, what tools we can use, and then we'll go into evaluation and interpretations from there. With that all in mind, let's dive into our first I, which is investigate. How do you measure this stuff? Well there's no one answer here. I think it's easiest to describe this in three major categories.

First one are what I call performance based tests. So in the sporting world, you'll see groups do

this where they'll take a vertical jump test every day. So you'll come in and every single day, you'll do say three or four maximum number of vertical jumps. And they look at the change, the assumption there being, if your vertical jump is much lower today than it normally is, then there's a strong likelihood your nervous system is a little bit fatigued. That is a very common and classic approach in the sport performance world.

Others do it with things like grip strength. Again, simple test, easy to do. There are reaction time drills. There's a ton of different apps and low or fairly inexpensive technologies to look at, firing rates, fingering tap tests, how quickly can you move your thumb, lots and lots of different technologies here. Others I've seen, and we've actually explored this a lot, have looked at things like range of motion and flexibility. And I've actually personally seen this one land pretty well.

So a basic sit and reach test of your hamstrings and low back, a rotational test, a forearm or a flexion extension test. I've seen all these in the field, a ton, and I'll be totally honest with you, they're pretty good. We spent many years, probably over four years, testing some of these things every single day. We stuck them directly up against other more scientific and validated measures, and they all came in pretty much the same. And so these are absolutely fine ways to measure it. It's obviously mostly used in the, again, the sport performance world, and so they are hedging towards the performance aspect. If you're not jumping as high or moving as well, that's what they're concerned about.

A totally different approach to this is more of a psychological assessment. Again, you'll see research, and I've seen now huge databases, you're talking about millions of data points stacked directly up against something like mood. How do you feel today? And you'll be stunned, stunned on aggregate in large populations. Mood is a very strong predictor of overall nervous system state. How tired are you? So fatigue is another question. One we see often is called RPE, so rate of perceived exertion. Just different ways to ask about how do you feel today? What's your effort feel like today? How interested in training are you today? Tons of different questions there.

That's hedged more towards your subjective experience, where the previous ones are obviously looking at objective performance, but there is classic overlap between both of them. The third one, though, that is more objective and where the bulk of the published research is, which doesn't mean they're better, by the way, it just means they're used more scientifically, are in what I call the physiological markers.

Common ones here are blood tests. I've spoke in season one. We had an entire episode on overtraining and overreaching. We also had one on how to interpret blood tests for high performance. In both of those, I talked about a number of different blood and salivary markers you can use to assess overall fatigue and readiness and performance. We'll have direct links to those episodes in the show notes. You can go check them out and see what I'm talking about.

But we're not going to get into that stuff today, because we've covered a lot of it already.

What we will get into for the most part are what I call the respiratory physiology markers. This is everything from resting heart rate to something called your heart rate variability, or HRV, to respiratory rate and CO2 tolerance. HRV, heart rate variability, is the king here. Not saying it's the best, but it has the overwhelming majority of the research is on HRV. You don't see a lot anymore on resting heart rate, and that's because it's not very sensitive. We used to look at it a little bit more. We kind of walked away from it.

If you get really shot for a long time, you're overtrained or highly chronically stressed, or have a chronic disease, you will start to see increases in resting heart rate that are not being explained by a lack of physical fitness or cardiovascular fitness. So you can see changes in heart rate as a result of this autonomic nervous system being pushed into a direction, in this case, more sympathetic than you'd like. But it takes a long time. You're not going to see the resting heart rate move for several weeks before you would really notice. And then the amount of movement is small. So it's hard to understand kind of signal to noise ratio there.

So honestly, kind of cross off resting heart rate. Not a great marker. I don't know too many people that use it by itself, or certainly use it as their first line of measurement. Now heart rate variability is much more documented. Respiratory rate is growing. That's something we're learning much more about. And CO2 tolerance is something that I have used a lot, but there's not a ton of research behind that either. I will share with you my personal experiences with all these things, but I want to spend most of our attention today on HRV because we have so much more information to go off of.

So let's dive into HRV. What is it? Why do you care? And how do we manipulate it? Heart rate variability is exactly what it sounds like. It is the variation in your heart rate. Let me use an example. Let's say your resting heart rate is 60 beats per minute. You would then assume that since there's 60 seconds in one minute, that your heart is then beating in this example, every second on the second.

And then if you sped your heart rate up to 60, 70 or 80 or 90 or 100 beats per minute, you would simply shorten the time between each heartbeat. But at the time between each heartbeat would be the same. It'd be one second or half a second or three quarters a second or whatever the case is. Well, in that particular case, there's no variation in your heart rate. That's not actually what happens.

If your heart rate is 60 beats per minute, what's going to happen naturally is maybe it beats at 1.1 second, and the next beat comes at 1.2 seconds later, and the next beat after that comes 0.9 seconds later, and then it comes at 0.8, and then it goes to 1.3. And so there's variations. At

the end of the 60 seconds, you'll still have done 60 beats, but it won't be a metronome. It doesn't happen every second on the second. How variable that is, is the marker we're talking about.

It's a little bit counterintuitive, but the more variation, the more parasympathetic you are. So the more variation in your heart rate, the more downregulated. If it becomes like a metronome, every second on the second, it's dialed in. That means you're in sympathetic drive. Now, as I said, parasympathetic and sympathetic aren't on off switches. They toggle back and forth. So HRV is just telling us kind of where at on that entire spectrum we are.

Generally, on average here, we want to spend more time in parasympathetic, meaning a higher HRV and less time in sympathetic. Most people struggle with spending too much time in sympathetic and therefore have a low HRV. Now, you can have the opposite problem, and we have seen that. I've coached people through that, where their HRV is extraordinarily high and then lethargic with no energy, no motivation and so on and so forth. But that's way more rare. Generally, I would probably say 95 times out of 100, it's the opposite. We're getting people out of so much time in sympathetic drive and more in parasympathetic.

A million explanations for this, but just as a practical example, you can imagine going from a high stress job, sitting in traffic, even if it's not a high stress job, but it's a job. You're around people, you're performing, you're in traffic, you're listening to podcasts, you're coming home, you're watching TV, and it's just sensory input all the time that requires your attention and reaction. If you're managing children, if you're managing other stuff, and there's just not enough quiet time that used to be around us.

Plenty of other reasons to explain it, but that's a good way to kind of understand the idea here of why most people are probably in sympathetic drive. If you want to say that that means we're in a more stressed life than we used to be, I don't know, I'll leave that up to you. But just from a practical perspective, we have way more arousal coming in way more frequently than we probably had for most of our experience as a human species.

So that's what HRV is, it's that variation and that's what it tells us. It is a snapshot into the autonomic nervous system, specifically parasympathetic and sympathetic drive. It is only one metric. It is not perfect. There is not a single metric I will show you today that is perfect, but it does have a lot of research behind it. So that's roughly what HRV is. It is, at our best guess, 50% genetic and 50% lifestyle. Admittedly, I am not thoroughly impressed with that research. I think that number is going to change over time. But it is inarguable that some point of it is not within your control and some part of it is.

Why that matters? When we get to the interpretation stuff later, it's not VO2 max. I can't just look at your HRV and tell you you're good or bad. You have to consider the fact that a large part of it

is not within your control. Tough to interpret. The numbers themselves aren't as specific as they are for other variables, again, like VO2 max. There's also a age-related decline that happens in your HRV. So it gets lower as you age. That said, a recent paper just came out, I think actually last year, and it argued pretty strongly that the age-related decline in HRV is not inevitable. And if you maintain function and fitness through life, that HRV should not drop as much, if any, but certainly not as much as you think. And so those are things that we are learning more about, but that paper just came out first time I've seen anybody even examine it.