



Transcript of “David Epstein on the Sports Gene & the Science of Extraordinary Performance”

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Dave: Hey, it's Dave Asprey with Bulletproof Radio. Today's cool fact of the day is that Tibetans can thrive in an environment with 40% less oxygen than there is at sea level. If you're from Colorado, and you think you're kind of cool and you survive on just a little bit of oxygen, 87% of Tibetans have a genetic mutation that lets them perform at high altitudes without adaptation to make more red blood cells. Basically, they just metabolize oxygen better than most people do, so I'm guessing it's that gene that helped a guy whose name I cannot pronounce but I'm going to do my best, Choeyang Kyi, who's the first Tibetan Olympian, and he earned a bronze medal in 2012's 20K race walk. He didn't have to use EPO, because he built it naturally, and that's badass.

Another cool fact of the day, a bonus one today, is that I'm doing a new biohack: Using very short-term extreme oxygen deprivation to raise my own EPO levels, and I'm going to keep you guys up to date on that as things go on.

Speaking of EPO and things like that, today's guest is David Epstein, who wrote an amazing book called "The Sports Gene." David is not just the author of that book, but he's won awards for hard-hitting pieces on sports science and medicine, Olympic sports, he's an investigative reporter, 2014 TED speaker. Basically, if you're writing about sports performance and ways to push boundaries, you'll find David's name all over it.

David, welcome to the show.

David: Thank you for having me, I'm really excited to be talking to you.

Dave: I've wanted to talk with you, David, for literally six months, and I've been trying to schedule this. All your writing and stuff is cool, but one of your skills is catching marshmallows in your mouth.

David: That's true.

- Dave: That was the reason I wanted to talk to you; pretty much, we're just going to talk about that.
- David: Thank goodness, because I've been waiting for somebody to ask about that, and finally the day has arrived.
- Dave: I just want to know, are they organic?
- David: I've put more emphasis on that in recent years in my life, so most of my training in marshmallows, they were sadly not organic.
- Dave: Nice. High-intensity marshmallow training is actually ... There's a whole book about that, but we'll got off of marshmallows. Let's talk about high performance. Why do you care so much about it? Do you have some sort of thing in your life that made you a high performance guru?
- David: That's a great question. The questions in my book in a sports scene came very much out of things that I saw or experienced. I happened to grow up in an area outside of Chicago that had this mini-Jamaican diaspora, so there are all these young Jamaican guys my age, and it made track and field really popular at my high school. We won our conference championship 24 years in a row, largely on the backs of these Jamaican runners.
- When I flipped open an atlas when I was 16 years old, and realized that's an island of two and a half million people, I started to say, "Boy, what the heck's going on over there that's producing all these people that are my best friends and my training partners?" Then I move up to a little longer distance in college, and now I'm meeting all these runners from Kenya racing against those guys, learning they're all from one, tiny town. Again, I'm wondering just what's going on around me.
- At the same time, I was training with a group of five guys, doing the same things day in, day out, eating together, sleeping together, training together stride for stride, and we're becoming more different, not more the same. I just started compiling these questions through my own training, about how these things could be.

Being a sports fan, and combining that with things like why can women softball pitchers always strike out the best major league hitters, just wondering. I had all these questions that I never really let go of. Finally, when somebody gave me the opportunity to take them on in the form of a book, I jumped at it.

Dave: So you were a runner, and you're running against these Jamaicans, and I'm assuming they were kicking your ass left and right?

David: I'm pretty fast, I ran at U.S. Indoor Nationals; in the sprints, they would usually get me. Once I moved up a little bit, then I had a lot of success, and then I had to face the Kenyans. I moved up from the Jamaicans to the Kenyans.

Dave: Ouch. You had a little sweet spot where you weren't as long as the Kenyans, and you weren't as sprinty as the Jamaicans, and you could ... The comfortable middle was your performance spot?

David: Precisely. Learning my place.

Dave: Are we going to see genetic testing early in life to help people know what sports to do, or are we going to handicap for genes in the Olympics?

David: Style?

Dave: What's going to happen there?

David: That's a good question. Actually, I was just interviewed recently because the Uzbekistan Olympic Committee has decided they're going to start testing children for a suite of genes to predict who's going to become Olympians. Now, what they're doing is not really going to work, because the kind of thing they're doing is similar to what a lot of companies that are offering genetic testing to parents for their kids are doing; they're testing for things like the ACTN3 gene, which is a gene that codes for a protein found only in fast-twitch muscle fibers. That's the kind that contract explosively for sprinting and jumping. If you don't have at least one of the

sprint versions of that gene, you won't be in the Olympic 100-meter final, period. That's just a fact.

That only rules out one billion of seven billion people on earth, and so it's incredibly nonspecific. You probably knew that anyway; you'd have a better genetic test with a stopwatch. Even though it's kind of sexy and avant-garde, they're really not actually going to get good information from it. Most traits are a combination of environment and complex networks of genes, and so I don't think we're going to see a lot of genetic testing quite yet.

You're better off measuring physiology directly. You're talking about EPO levels and hematocrit, the proportion of your bloodstream that's red blood cells. Those are things you should measure directly, rather than looking at the genes that have something to do with them. I always tell people, "Why test for height genes when you can use the tape measure?" So I don't think

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Dave: That's brilliant, by the way.

David: I do think there will be more ... Already, we've seen people being slotted into certain sports based on physiology. Only in rare cases do I think that will come directly from genetic testing.

More so, I think genetic testing is going to have an influence in helping people manage injury. We know there's a gene that disposes some people to having permanent damage when they take concussions, and that gene is highly over-represented among the former NFL players who are having their brains dissected. Those people just don't have the same threshold for insult to the brain as other people do, and that's the kind of thing I think that we might see being put into use.

Dave: There's another gene for hyper-flexibility. When you have that, your chances of getting knee and shoulder injuries are much higher, so maybe you shouldn't play soccer competitively or pitch, because you're going to spend a lot of time training and then you're going to get injured, and it's not going to heal right.

- David: That's right. Versions of the collagen genes, which are ... People call it the body's glue, holding together tendons and ligaments, and people with certain versions of some of those collagen genes are quite flexible but also prone to, like you said, tearing tendons or ligaments. Some of them that have a really extreme version have this syndrome called Ehlers-Danlos syndrome. Those are actually the people in the circus, who are so flexible they can fold themselves into a box and that sort of thing.
- Dave: Those people just make me mad, those really flexible people.
- David: Right, there ya go.
- Dave: If you're listening in the car, I just put my ankle behind my head. If you're watching on YouTube, then you just caught a view of my leg in a strange spot. I tend to be more flexible, but I wasn't always; it's partly because I take enzymes that dissolve adhesions, but also I'm probably more flexible than average.
- David: Some of those people ... I wouldn't necessarily go as far to say that those people shouldn't play soccer, but I do think they should be ... Exercise geneticists have started introducing the term "pre-habilitation strengthening exercises" that they can do before injury, because they might be at increased susceptibility. I think that's wise.
- Dave: It's one of those things where, for my kids, I would love to have ... Are you likely to spend a lot of time with knee surgeons if you do this kind of sport? Maybe you should swim or lift weights or something else, or wrestle or whatever. Knowing that is valuable, but when I go back to what's happening in Uzbekistan, the Eastern Bloc has a history of doing stuff 30 years before everyone else. I do a [Whole Body Vibration](#); behind me, that's my vibration plate. That came out of the Russian space program, where ... It works. It increases bone density in those studies, which is really amazing.
- That was an athletic performance and a space performance thing. Also, some of the first electrical stimulation stuff came out of Russia and East Germany, and they'd knock people out, put a stick in their mouth, and then

run all these currents to make them grow muscles. They'd inject them with all sorts of crazy hormones and whatnot, but hey, they won a lot of medals.

Those advances came at great personal cost for the people that did them, but we can still take advantage of them now. I wonder if the sort of crazy-sounding stuff in Uzbekistan is, 30 years from now, we're going to be, "Oh, we can already pick out our 80% most likely to medal people using this complex set of genetic variables and, probably, epigenetic variables." We going to get there?

David: I think we're going to get there partway with genetics; I think we're going to get there partly just because we have a better understanding of physiology. I think you're absolutely right, some things that are being done early one that are kind of scatter-shot, some that work and some that don't, we'll come to understand them. We're approaching the thousand-dollar full genome sequence, and we'll come to understand some of these things a lot better.

Probably the most famous exercise genetic study of all time, one that I write about in the book, is the HERITAGE Family Study. It looks at why people can be put on absolutely identical training and have incredible differences in the way that their bodies change. In one segment of that study, where 98 two-generation families were put on - sedentary people - put on five month intense cycling training program, spread across four university centers, controlled in the lab, they found a 21-gene predictor set that could tell who would improve in response to this same training.

People who had at least 19 of the good versions of these genes improved the amount of oxygen their bodies could move three times as much as people who had fewer than ten. This kind of thing, that can explain why there's no sort of cookie cutter training program, I think we can ... Rather than saying, "Hey, you have to go to this sport," we can tell people, "Look, this is why you're not getting a certain benefit from this training program; let's try this other thing, where you might get the benefits that you're looking for."

I hope that instead of moving toward trying to pigeonhole people based on their genetics, we move toward trying to show them that there are more options, and some that might get them where they want to go. I get asked a lot, "Do you think this is sort of scary, that we're all going to be told what our destiny is?" What I think is, rather than hiding from the information, the way to move forward is to find what differences between people are real, first of all, and then which ones are important; then use those to try to get the optimal outcomes for every individual.

Dave: Okay, I buy that. So, there's going to be a set of interesting knowledge that we can pick up there. What are the things that we can do proactively? Can we grow new mitochondria? Like, okay, I have some genetic stuff, my whole life basically was like, "Someone says you should do that" - because I'm a hacker - someone says you should do that; watch me not do that, but there's that little impish desire that's like, "Actually, you could probably break that if you just pushed it right there."

That can be channeled for good, or you can really break stuff that way, and that's why we have black hat and white hat hackers. When I turn towards my own body, I'm like, okay, I have these strengths and I have these weaknesses, but I don't actually accept those. What are the things that are lowest-hanging fruit in the research you've done for your book that let people basically do things that they're probably genetically not supposed to do, without getting hurt?

David: I think for one, tailoring training based on muscle fiber type proportions and things like that. There are countries that are now doing this, and they give all the athletes a biopsy; they look at some of the metabolic qualities of muscle fibers, as well as whether those muscle fibers are contractal speed, things like that; whether they're fast-twitch or slow-twitch. Of course, that's breaking down a complex spectrum into simple terms.

We know that those people who have these different physiologies, it's a zero-sum game when it comes to muscle fibers. The more type 2, or fast-twitch, you have, the fewer type 1, or slow-twitch, you have. Training can make fast-twitch fibers more endurant, but it doesn't make slow-twitch fibers twitch faster. That sort of limits your explosiveness. We know that

people should be trained very, very differently based on those kind of qualities, and sometimes people who are really explosive physiology will just ruin their strengths if they train too much volume, and things like that.

I think looking at training to maximize what your physiological strengths are, and in some cases, for some people, that means less training. I read about a Danish scientist who in the book who will take guys who think that just training more is better, they'll have a huge quantity of type 2 muscle fibers. He'll say, "You need to do a few sessions of really heavy lifting, sleep right after, as soon as you're done training just go to sleep, and start taking more days off." He took a guy that was sort of good, and turned him into an Olympic medalist doing that, and then the guy went on "Dancing With the Stars," and he got elected to Parliament and all this stuff, because he had a muscle biopsy. In Denmark, you know, small country, when you win Olympic medals, things like that happen.

He took another guy, a rower - a kayaker, actually - who was not quite making the Olympic team. He looked at him, he said, "The guy's got 90% slow-twitch fibers in his shoulders; the guy gets beat off the line every race. He starts to catch up, but he never makes it in the 500 and the thousand."

So he tells him, "Move to the longest distance that you possible can." Instantly, the guy's world class.

Dave: Wow.

David: Most people aren't going to get muscle biopsies, but we at least need to be taking a trial and error and self-reflective look at ourselves and our training, instead of just looking to whatever fad is working for our neighbor, basically.

Dave: The biohacker in me says, "Shouldn't I just take myostatin inhibitors, and run massive amounts of fast-twitch electrical current over my muscles to encourage them to grow new muscle fibers?" Stuff like that isn't impossible at all; the myostatin inhibitors have been on the market. With questionable safety, and maybe you'll get cancer, but you've been able to

buy them for more than a decade. Shouldn't we just grow more fast or slow-twitch to do what we want?

David: As far as the electric stimulation, that has actually worked in rodents, stimulating them electrically; but they actually have capacity to switch muscle fibers a lot more easily than humans do. When humans were actually tested with that, hooked up to electrical stimulation eight hours a day, it didn't work. I'm not sure that route will actually work; what I think we can do is condition some of your muscles without you having to work as hard. I don't think ... There's no evidence it will flip the fiber type. As far as the myostatin inhibitors -

Dave:

David: - I think most of the ones that are out there, like I remember various types of seaweed were out there for a while, haven't had good results when they've been really tested. Right now, there are a number of pharmaceutical companies testing myostatin inhibitors and follistatin inhibitors, a related protein, because it might help mitigate muscular dystrophy. There's some promising results coming out of clinical trials, but nothing proven that's on the market yet.

If that does hit the market for muscular dystrophy, you better believe people are going to be using it for just normal muscle building. Absolutely.

Dave: That's the perfect segue-way into the low-hanging fruit, obvious thing to talk about, which would be steroids. You've written really heavily about steroids in baseball. If you're not a pro athlete - say you just don't want to be old - is there a case for taking steroids?

David: I think there is, and I think the devil's in the details, basically. I think a lot of the youthful effects that people attribute to human growth hormone are unproven; and since so few people take human growth hormone alone, it's really difficult to know what's doing what for them. I think undoubtedly there are cases where supplemental testosterone is something that people should be doing. I think they should try to correct their sleep, their physical

activity, their diet, first, because you should do that anyway, and it helps a lot.

When I've talked to some pro athletes, they know, they've heard all this stuff about growth hormone, but they don't pay any attention to their sleep. They sleep for four hours a night, they're traveling like crazy; then you show them the curve of growth hormone secretion if they get good sleep, and it's earplugs in, eye mask on, going to sleep. You can boost your own natural secretion of these hormones.

I absolutely think there are times when it's appropriate for people to have testosterone replacement therapy or replacement of other hormones. I think that also there's some marketing out there that's ahead of a lot of the science as well, as far as hormone supplementation goes, and I think that people should really learn a lot about what they can do naturally that's healthy for them in a lot of ways before they jump to hormone supplementation.

Dave: Well said. I've been involved in the anti-aging movement for more than a decade; I run the Silicon Valley Health Institute, I'm chairman. For 20 years, this group has had top experts in aging come in and give lectures about these. If you don't take care of the basics and you go straight to hormones or drugs, you're missing the point about solving all the different aging things that can happen.

I have seen, in my dad, I convinced him to go on growth hormone before an abdominal surgery to correct another previous surgery thing. In six weeks, I've never seen such a dramatic change. His skin looked different, his energy was different, he lost a ton of weight; but he was around 60 at the time, and obviously his levels were pretty low, and it was pretty amazing.

In my own case, at 30 I tested extremely low on testosterone, and actually very high on estrogen, because my body is very quick to go down the estrogen pathways. I went on, with the help of a physician, a prescription, normal dose bioidentical testosterone replacement therapy. I was on it for about ten years, and about nine months ago or so, "I'm going to see what happens when I go off of this." I've corrected my sleep, I've written sleep

hacking stuff, and my diet's amazing for hormones and all of that, and my levels have dropped to about a third of the max level where they could be at my age; but my muscle mass, I'm reasonably muscled for a 41-year-old guy, and I'm not having any negative effects from it.

I'm just going to see what happens when I'm not on it, but I'm guessing that I'll probably go back on it. I'm very open about it; people are always like, "Oh my God, he's on testosterone." Yeah, my levels have never been above where they should be for my age, but if you ignore that when your body's not producing it, I think you do so at your own peril. If you're not working with a specialist, or you're taking the methylated forms that basically break your liver, you can die.

It's such a complex topic, but I appreciate when people take the time to write about it, as you have, and looking at it for use in pro sports versus other uses. We're still learning about it.

David: Yeah, and the fact that you're taking a trial and error approach to it to see how you feel, like you said, your levels drop, but maybe you'll be asymptomatic. There are a lot of factors; I think sometimes people fixate on one number of a certain hormone, instead of looking at themselves holistically and seeing how they're feeling, and how they're doing. The structure of someone's androgen receptors has a lot to do with what kind of effect they get from supplemental testosterone, or from their body's own testosterone.

There's a lot that goes into it that's more complex than just that one number that I think people fixate on a lot. I always advocate for people looking at themselves holistically, as opposed to just a batch of numbers.

Dave: The most important thing you can ask yourself is, "How do I feel?" If the numbers are good and you feel like crap all the time, and you're angry all the time, I don't honestly care if you have a six pack or you can bench press the most, but something's wrong. That whole ability to titrate your amount of energy and willpower every day is important, and it's hard to quantify, which is why we tend to ignore it in favor of ridiculous numbers like total cholesterol and ... Who cares.

David: Yeah. To go to your point, too, about growth hormone, one thing that I think is unfortunate is, I think it was - and I've written about this before - growth hormone became more restricted than I think the government meant for it to be when they moved it - when they legislated it. It's unfortunate, because it would be nice if we had a bigger body of research on it. That, I think, is frustrating.

Sometimes I think pro athletes can actually do damage when they use certain drugs while completely demonizing them, and that affects legislators sometimes. Sometimes we end up regulating things that make them difficult to research, before we've really found out what they can be useful for and what they might be harmful for. That bugs me sometimes, the effect that athletes have had on restricting, or demonizing, certain things that maybe shouldn't be.

Dave: When you look at Formula 1 racing, you have all these amazing safety innovations and performance innovations, and ten years later, they're in your Honda. There's this high performance engineering that you might wreck, you might die, and if so, it's going to be fire and everyone wants to see it, so they're going to pay money for it. But, we all benefit from that.

When it comes to pro sports, if you're on something and you never tell anyone, then no one benefits from it, and you still might die a fiery death, because your liver can turn into your kidney or whatever else happens as a side effect from whatever you're taking. I almost wish that we'd be like, "Okay, this is something that many pro athletes use. If you would just register what you're using on this thing, and you don't have to tell us 'til after the season's over, but we all get to know." Or even put it by a review board or something. I feel like we would unlock so much knowledge about human potential that's currently hidden, because there's this wall.

We want fairness on one hand, and I admire natural talent; on the other hand, we want knowledge. There's got to be some comfortable middle, and I have no idea how to make that happen. Do you? Or is this just a bad idea?

David: I don't know how to make it happen, and I don't see it happening from pro athletes; but I think there are so many ... They're governed by certain rules, and they have a lot of disincentives, obviously, from being open in any way about that. There are so many other people that are using hormones and various other drugs. Elite athletes are the pencil tip of the market. I think that's a common misperception among not ... You know that, but for sports spectators at large, that's not what's driving the industry of these drugs; there's so few of those people.

I guess I just wish there were more ... There's the occasional doctor or scientist who immerses themselves in that community and builds some trust and some rapport, and does some research, but it's very, very rare. I think that's a missed opportunity.

Dave: It is, and in my own path, there's enormous knowledge to be gained from the body building and weightlifting and pro athlete communities, because they're pushing human limits in ways that are so amazing. Their goal is, do whatever that sport is at any cost. There was even a survey a while back where they asked a bunch of pro athletes, "If you could be number one in the world, but you were going to die in five years, would you do it?" A shockingly high percentage of people were like, "Hell, yeah."

They're so focused, and I admire that. On the other hand, I met my wife at the American Academy of Anti-Aging Medicine, where ... I'm not a doctor, but I tend to go there because that's where the latest research is. There's this "never die, and kick ass forever," and there's some overlap in the middle; that seems to be where the neatest stuff is happening, where you want to look good, you want to feel good, you want to live a long time, and you want to kick ass; but you have to get all those variables together at the same time.

The doctors who are working on that front, who talk to the pro athletes and then talk to the anti-aging guys, who only eat 600 calories a day and are cold all the time, there's something to be learned there. Guys like Ray are looking at that; looking at calories in, looking at cold thermogenesis, and I suspect that that "top performance without harming yourself" science has barely, barely even been done.

David: The one thing I want to add about that study, where those guys said they would take a ... It was this survey where they said, "You could take an undetectable drug, you'll win everything for the next five years; but then you'll drop dead," basically, if it's undetectable. I got really curious about that study, because I would hear it cited, and I could never find it anywhere peer-reviewed. The only place I could find it was in a Sports Illustrated article from the 80's.

Some researchers, a year or two ago, tried to repeat it, because it had never been peer-reviewed. They did find some athletes like that, but the percentage was much, much lower.

Dave: Oh, okay. I don't really know this study -

David: So that doesn't really change the point ...

Dave: No, it's awesome that, A, you knew what I was talking about, and B, that you did the investigative journalism there. So kudos, and thank you for that. It's awesome.

Steven Kotler's been on the show, I've actually become friends with Steven, the guy who wrote "The Rise of Superman." He's the keynote speaker at the Bulletproof Biohacking Conference -

David: Guy.

Dave: Quick plug, September 26th through 28th, bulletproofconference.com in Los Angeles, 37 amazing speakers including Steven. Genome stuff all over.

Steven's like, "Okay, athletes are getting faster, better, stronger, it's because they've accessed the flow state, and here's the recipe for doing it, and here's how we can do it to you with a little bit of help from technology."

In your TED talk, though, you asked the question, you posed the question, "Are athletes getting faster, better, and stronger?" If people haven't heard your TED talk, what's your answer?

David: My answer is that in many cases, in the easily measurable sports, athletes have in many cases went through a period of explosive improvement, and then plateaued to the point where changes in technology make a larger difference than changes in human improvement, at the top level, anyway. Some of that, in some ways, I don't think it's contradictory from what Steven says. Love his book, by the way.

Stephen Jay Gould made a hypothesis about complex systems, where said that in complex systems, as people learn to manage all of the different variables, performance will converge. We've now seen that in basically every sport that's been contested for a long time, where differences between performers at the top level are getting so, so, so small. I talked about that at the beginning of the TED talk.

These sports are definitely getting deeper, with more people accessing the highest level of performance; but the records, for instance, are either not moving, or in severely diminishing returns. Then they're upset when there are big changes in technology or big changes in the way that we screen people for sports. There's a section in the TED talk where I talk about the artificial selection that's occurred in sports for specialized body types, and that's an entire chapter in my book, called "The Big Bang of Body Types."

There was this self sorting in the late 20th century to put specialized bodies ... Elite female gymnasts have shrunk from five-foot-three to four-foot-nine in 30 years; the proportion of men in the NBA who are least seven feet tall has tripled; so now, if you know an American man between the ages of 20 and 40 who's at least seven feet tall, there's a 17% chance he's a current NBA player. Forearms of water polo players have gotten longer in relation to their whole arm, for more forceful throwing whip.

There's this artificial selection improvement among all athletes, as they learn the sports and they learn the right training regimen. We've done so well at that in some sports that now the biggest changes come from changes in technology, and not the changes in the athletes themselves. I don't think that's a bad thing, personally. I think sports, the technological component ... First of all, I think having deeper and smaller differences

between competitors is very cool, that means more people are getting to the higher level.

I also view a lot of this technology and talent identification as part of the creative endeavor of sports. Sometimes people ask me if it ruins sports viewing for me, and my answer is absolutely not, not at all.

Dave: In my view of the world, a better set of more aerodynamic wheels or a swimsuit with less drag, or an injection of a certain substance before a race, are all fair uses of technology, as long as people benefit from it. In history, has there been another group of people that would agree with that? What would the Greeks say, going back to the original Olympics, about doping?

David: That's an interesting question, because my view is a little bit different on that. The Greeks actually, they were not ... Taking substances was par for the course for them. What they really had a problem with was bribing judges and that kind of thing. That kind of corruption, forms of favoritism and things like that among judges. People who did things like that, they literally would put statues of those kinds of cheaters outside of the Olympic stadium, so people would pass them when they came in, they'd be immortalized as cheaters forever.

The kind of cheating they cared about was different, and it didn't have to do with substance abuse. I believe they were taking all sorts of things for dulling pain, or increasing aggression, and so on and so forth.

Dave: Interesting. The moral compass around that has swung, and I don't know that we'll ever realize that there is quantitative proof that this is the ideal thing. There's a lot of emotion, and a lot of opinion, and a lot of the old, puritanical roots of the U.S. come into this.

There are other things we can do for performance besides taking steroids or the other things. What about the 10,000 hour principle, I've talked about that before. The idea is that you need to practice something 10,000 times or 10,000 hours in order to get that neurological adaptation. Is that legit, and can you hack it?

David: The 10,000 hours rule, as a rule, is not legit. Insofar as it is a code word for "lots of practice is really important," yes, absolutely, but that's been completely uncontroversial among sports scientists for quite a while. The idea, the strict version of the 10,000 hours rule, that 10,000 hours of practice... That there's no such thing as natural talent, and 10,000 hours of practice is necessary and sufficient to make anyone an expert in anything is simply not the case.

It comes from a tiny violin study done on 30 violinists, who were so highly pre-screened they'd already gained admission to world-famous music academies. It's what statisticians call restriction of range, and it's the worst kind, based on your dependent variable. It would be like doing a basketball study, the study of basketball skills, starting with only NBA centers, noticing they'd all practiced a lot and saying therefore, only practice got them where they are, not practice plus being seven feet tall. By restricting that subject range, you hopelessly bias your study against finding any evidence of innate talent.

Actually, Anders Ericsson, the psychologist at Florida State who did the work, that violin study, has been so dismayed with the portrayal of his work that he has a letter now linked on his faculty web page at Florida State, the title of which is "The Danger of Delegating Education to Journalists." Pretty ominous.

The reality is that there's quite a large range. The ten best violinists in that study had an average number of hours of practice by age 20 were 10,000, but most of them had not reached 10,000. It was just an average, and some had gone way over. There's actually quite a bit of variability, and that's what shows up in all studies of skill acquisition. Chess, which is incredibly dependent on the brain and coding certain patterns, it's 11,053 hours on average to international master status, but some people make it in 3,000, some are still being tracked at 25,000 and haven't made it. There's really this incredible amount of individual variation.

Dave: That blows out the 10,000 hour principle.

David: I cheekily subtitled the second chapter of my book "10,000 Hours, Plus or Minus 10,000 Hours."

Dave: I love that title.

David: Some people think it's depressing, but I think you have to make a case for people going through what sports scientists call a sampling period, reflecting on themselves and finding the best way to use what they have, instead of saying, "This is the path for every person, and we're all going to do the same thing, we're all going to get there," because that's been pretty blown up by exercise genetics and other aspects of sports science.

Dave: Are there ways to accelerate it? How do you hack the training thing, so you can do it faster?

David: Again, depends specifically on what you're looking for. In some endurance sports, it would be something as concrete as moving to altitude, for example.

Hey, by the way, before I go to that, do a quick detour. That 10,000 hours study, one thing I noticed. It didn't report a measure of variance in the hours of practice, I had to ask Anders Ericsson for it; but the best group was also sleeping 5.4 hours a week more than the [crosstalk 00:34:46] -

Dave: Oh, more, okay, cool. I thought you said 5.4 hours a night, and I was going to dance a jig, but all right.

David: No, more per week. This could very well have been the 5.4 hours rule study, if things had gone differently.

Dave: Let's write a book, David. We'll call it, "The Sleep Effect." We'll use just that 5.4 number, and we'll create a whole wave of sleep if you.

David: The 5.4 hours rule, I'm ready for it.

I write briefly, but not super extensively, about talent studies in Netherlands, they're really progressive about sports science. They've been tracking kids in a variety of sports from age 12 to the pros, like elite ...

Netherlands has been second and third in the last two World Cups, population of 16 million, so they do a great job with their soccer development. One thing the found is the kids that learn skills more quickly when they practice are the ones who, if you see them in their research videos, they're going up to the trainers and going, "I've already mastered this drill, why are we doing this? Which of my weaknesses is this working on? I want to try this other thing, because it's harder for me."

They look like they're being insolent 12-year-olds, but they are self-assessing constantly, figuring out their weaknesses and their strengths - what sports psychologists call self-regulatory behavior. They're constantly looking at themselves like an experiment. They end up assessing their weaknesses much more similarly to how the coaches do than the other kids, and they continually improve, they don't plateau. I think that seems to hold across all the sports in the talent studies.

These kids, they have certain physical traits; but aside from that, they tend to be these kids who are taking accountability for their own practice. They become the orchestrators of their own development, and they're constantly assessing, coming up with a plan to work on a weakness, seeing if that worked; if it didn't work, revising and trying again. Going through that cycle. They get more out of their practice hours than their peers.

Dave: Maybe we could be training the ability to self assess, or what I suppose you'd call self awareness. When you're more aware of how you're performing, either in relation to yourself or others, maybe you're better at making small tweaks that change things.

David: It's definitely coachable, and they're showing that in their studies. I have extensive citations in the back of my book, and some of them are there. I think they're finding that in some ways, the most important role of a coach is helping someone become that orchestrator of their own development, who reflects on themselves; and then eventually passing their development off to them, and letting them go.

To go back to maybe a more concrete part of your question, there's some ways that we know we can hack certain skills. In golf, there's something

called the "quiet eye period" that's becoming a big deal. It's actually in a lot of the targeting sports. In the two seconds before putting, Tiger Woods' eyes fix on the back of the ball, the spot where he's going to hit, and they stick there. In that same two seconds, a lesser golfer's eye will have hit six different spots on the ball, and they won't know it. If you ask them where they were looking, they'll say, "I was looking right there," but if you put tracking glasses on them, it won't be true.

They can't be trained explicitly; if you say, "Keep your eye there," it doesn't work. But if you say, "We wrote a word underneath the ball, and I want you to read it before you look up after you hit this putt," in over two weeks, it'll start making their gaze more stable. I think the average is they take off about 1.9 putts per round, in two weeks, for people who are already pretty good amateurs.

I preach this "finding what matters and what you can change," and things like quiet eye we know matter to sports performance turn out to be incredibly coachable. Cutting edge sports science is finding some of these things, that you can then train really quickly and accelerate your progress.

Dave: I've been fantasizing for about seven years that someone would come out with eye tracking software that really worked for webcams, that would just do it automatically. You can tell so much about how your brain works by how you read letters, and just by all the things that ... I've been fortunate to work on a few different things where I did wear those, and it's shocking to know what your eyes do. You can learn an enormous amount about the whole nervous system there, so the idea that someone took that and projected it into golf is awesome.

That's kind of a hack, it didn't take 10,000 hours; it took two weeks.

David: Those results are showing up for free throw shooting, throwing darts, any type of targeting sport basically. There's a lot of cool new data coming in, and research on how to train this effectively. One company called Right Eye, that has made ... It hasn't done quite what you've suggested, but they've made glasses that are very unobtrusive that you can wear while training, and they take eye tracking data and things like that. I think we're

getting to the point where that technology is becoming so easily available that we'll learn that it's right.

Dave: I just put on my orange glasses. The reason I did that is because they're actually performance optics as well out there. Oakley's making some, Nike has some contact lenses and things like that. It seems like the eyes may be a very hackable area for athletic performance, as well as just overall cognitive performance.

David: Skiers, for example, for years have used tinted plastic in their goggles that gives better contrast, it improves their contrast sensitivity when they look at the relief of the hill, and that's really simple. I know some places have tried to do that with contacts with arguable success, but no question I think that's fertile for finding some tricks.

Dave: People always ask me why I have this custom tint on my glasses, this kind of rose-orangish color. It's because I had my brain tested for what colors make it relax the most, and when I wear those indoors, I have massive amounts of better energy. I can think better, I can last longer, I have more endurance. The woman that invented this stuff found that 48% of people have benefit from certain color ranges, and it varies by person, and you can test it. Her name's Helen Irlen, she's speaking at the Bulletproof conference about this because it's almost unheard of, but she even has athletes doing this, and people who aren't dyslexic or autistic or whatever else.

Those people benefit greatly from it; it might be weird, but there's probably someone out there who a light lavender tint on his or her eyes could radically change how they hit, how they throw, how they run, and we just haven't even done the basic work on that. I feel that there's so much around eye tracking, around eye teaming, around eye balance, that I plan to do some more writing this year about, just because ... Not just for athletes, but for everyone in every walk of life, to get your eyes a little bit better trained is maybe more important than lifting something heavy right away.

David: That's interesting. I'd love to see that work. As you know, I'm interested in individualizing treatments and training, and that's work that I didn't know about. I'd be really interested to learn more.

Dave: I'll hook you up with Helen Irlen directly if you'd like. She's been doing it for 30 years and I believe her work is amazing. All of my clients who have decided to get their eyes tested have been like, "Wow, these glasses really work. Maybe I'll wear them; maybe they don't look so cool, but I'll wear them sometimes."

David: I thought yours looked pretty cool. I was like, "I would have worn those for fashion." That might also say something about my fashion sense.

Dave: That's a fair point. I just tell people I'm in training to be a rock star, and I usually get away with it. If only I had the musical talent.

We've talked about supplements and drugs and electricity and eye teaming, but we haven't talked about food. Can a good diet make you hit faster, or make you hit harder, or any of these other things? What does your work around the role of diet and sports performance say?

David: I think it's an under-attended issue for the vast majority of athletes. I think some of it depends on your ancestry, to a degree, what your ideal ratio of carbs to proteins and fats and things like that should be; but the fact is that most people don't experiment with it at all, frankly, to try to find out what's best for them. I think most people, sadly, most people would probably be better off spending two minutes putting any thought into what they're putting in their mouth, for the most part. We're starting at a pretty low baseline, I think, as a society.

I think there's no question that the fuel that you put in the tank impacts everything. It impacts your body composition. It impacts hormone levels. There's no question at all, and for the most part we're not paying good attention to it. It's hard to put a blanket assessment on it, but I think it's an area where almost everybody can make some life and fitness improvements. Almost everybody.

If you're incredibly ... I spent some time running with the Kalenjin marathoners, that's the minority tribe in Kenya that produces all the best marathoners. To put their achievement in perspective, 17 American men have run faster than two hours and ten minutes in marathon history, and 32 Kalenjin men did it last October. That's a minority tribe, 12% of Kenya.

Dave: Statistics like that are awesome. How can you argue with that?

David: Yeah. They eat basically an all-carb diet, they eat this maize meal called that I think would not be recommended for most people, to eat an all-carb diet. That said, one, their ancestry's different; and two, their physical activity levels are incredibly high and at altitude. Sugars can be a good fuel, if you're about to go out and burn it right now, which they generally are. I think a lot of it also depends on your lifestyle and your needs.

Dave: We have too, who are eating 60, 70% starch. It's not like you can't do it, and there are huge gut biome issues we're just figuring out around the type of starch, and what grows there, and what actually turns the starch into fat in the gut. I generally find that, in my own experience in the anti-aging circles and all, that limiting carbs tends to make people leaner, at least people who live in the West and have normal Western lifestyles.

If you walk miles a day, things are different. If you're training really heavy and you were on a zero carb diet ... Some people, they absolutely kick ass on ketosis. I've interviewed world champion athletes who haven't touched a carb in a year. Then there are other people, who I'd say are more common, that if they're on that regimen, their blood panels don't look good, and performance suffers even if they can do it.

There isn't a one size fits all, but there are general principles that seem to work for 99.9% of people, and I think that we have enough knowledge between the pro sports fueling, the nutrition side, and then the aging side, to say there's at least some best practices. I like to think there are, and certainly, in my own life, 100 pounds lost seemed to help.

David: That's awesome. One thing that bothers me is that there's so many, I think even a lot of people who have good intentions, are fooled. There's a lot of

marketing of things to make them look like health food. Some things that aren't terribly unhealthy; think about people say, "I'm going to have a healthy breakfast, I'm going to have oatmeal." Well, most oatmeal's using rolled oats, right? Really, if anything, you should be doing steel-cut oats, not rolled oats, because they're basically taking away the part of your digestive process that you want to act, so you're going to have a different kind of insulin spike and things like that.

It bothers me how difficult it is for the average consumer to interpret the food that they're buying. That bugs me.

Dave: I see these gluten free products now. Like, really? You took out gluten, you have raw garbanzo beans and high fructose corn syrup. Between the inflammatory response from the lectins and the insulin and the triglycerides, honestly, maybe you just shouldn't eat whatever that concoction was, and you should just eat a piece of food that you can recognize.

Yeah, the marketing's gone nuts, and the regulatory side of that just makes it really hard for food companies who do make healthy stuff.

Every paleo food company out there would love to put a "heart healthy" logo on their stuff because it is, but it's the exact opposite of what get's "heart healthy," which is Cheerios. I'm always just dumbfounded by that, and realize that there's so many things that consumers don't understand that food companies are bound by. It's a Byzantine set of things there, but by the end of the day, cheap stuff gets marketed as healthy, and that's destructive for athletic performance and just for human health.

David: Yeah, it's too bad, like you said, of the gluten free products, because that's people who are either need to, or trying to, make a change for their health, but they're ending up getting products that are just replacing the gluten with some kind of sugar or sugar substitute, because they then want to make it taste good, because it doesn't have gluten anymore.

Dave: It's not right, and it's confusing. Trying to take this incredible set of knowledge and then make it into something that you can do without having

a degree or an enormous amount of time to research it, it's tough. I think it's one of the reasons that you see pro athletes eating Mike and Ikes or a bunch of cherry Twizzlers before they go out to play. It feels like sugar, sugar's energy, I exercise, I need sugar.

But when you get Cate ... What's her name ... Cate Shanahan, who worked with the Lakers, and put them on a diet that's super high in fat, they're drinking Bulletproof coffee, and the difference how most of the players felt was amazing. Some of them were like, "Screw that noise, I want sugar." Even at the premier level of performance, the differences are so profound that I'm hoping that science and Internet and [inaudible 00:48:40] science, and even hard investigative journalism, like we're doing, will at least help to directionalize things, even if we never are exactly prescriptive.

Are you hopeful that we're going to see improvements there, or is it just my being?

David:

I am very hopeful, and I think we will. I think it takes time; I think it's like steering an oil tanker, you have to start from 40 miles out from shore before ... There are going to be people who are willing to, and can invest a lot of their own research time in this who are going to be ahead, of course; but in terms of the mass of humanity, I do think so. I think already people are having to change their ideas about fat to a degree, and I think that's starting to seep into a larger segment of the community. I think that will continue to happen.

Things like eggs carry a major stigma for some people because of some epidemiological studies that I think have poorly controlled the number of variables. If eggs turn out to do the worst things that previous epidemiological studies have said they do, I'm going to be in big trouble, because I eat a lot of eggs. Quality eggs, not things that are pumped full of hormones and all that kind of thing.

I think there's already starting to be some change, and that we're going to see a typical pattern, which is some early adopters who are going to start spreading information to their networks, and then it will take some time. People hold certain stigmas about things they've heard without even really

knowing why they do, but they can be really, really hard to change. I think even as people hear different things about fats, that emotional part of brain that it's embedded in, that really takes time to change.

Dave: Even now, if you say coconut oil on the street, the first word that comes to people's minds is cholesterol.

David: I cook my eggs with coconut oil in the morning for breakfast.

Dave: It's a wise move, because it's stable under heat. If you're going to heat fat, you don't want to do it in olive oil, that's for sure. You do it because you're educated, but the average person still has these weird correlations that came entirely from the American Soy Association's marketing campaigns. Once that gets stuck in our collective consciousness, it's pretty hard to get unstuck; but I think the Internet is starting to do that. Work like yours, even, is where people go, "Let's look at the science, let's dig in, and let's do it."

Speaking of digging in, we're coming up on the end of the show, David, and there's a question that I've asked every guest on the show.

David: Okay, I have one thing before we finish that I want to tell you, since you started talking about EPO. Can I stick it in now?

Dave: Please, please, yeah.

David: The last chapter in my book, which is one of the coolest experiences I've had as a reporter, the main character is a guy named Erro Mon-ter-on-ta who was the greatest, probably, endurance athlete in the world in his generation. Finnish skier, 7-time Olympic medalist. When I went to visit him, he's retired, working as a reindeer farmer in the Arctic. He had hematocrit, which is the proportion of your bloodstream which is red blood cells, in the mid-60's in his competitive career. Just for comparison, you're not allowed to start the Tour de France if you're above 50, and he was in the mid-60's.

It was always thought that he was blood doping, and 20 years years after his career ended, a group of Finnish scientists started noticing this in his family members. It turns out, they have a gene runs in their family that causes a truncation of the EPO receptor. The receptor's like a lock, the hormone's like a key; when you put the key in the lock, it kicks off red blood cell production. The truncation of that receptor took away the gauge that says, "Okay, enough red blood cells, stop making them," so they had this runaway red blood cells.

When I went to visit him, when he was younger you couldn't tell, but now his skin has turned all purpley and red. This was an amazing example of a guy who was naturally EPO doped, which I thought was fascinating. Since you started off talking about that, I just thought it'd be a cool ending.

Dave: That's amazing. Basically, there was a hacked feedback loop. Where there should be feedback to lower this, but by changing a feedback ... There's probably something you could do with an athlete today, maybe not to change the shape of a receptor, but there's probably something you can do to interfere with feedback loops in the body.

It's crazy, when you look at the hypothalamus, the pituitary, and all the other hormone systems that are affected, and there's hundreds of different feedback loops in there. I think there's enormous science to be done around carefully modulating those so that you can do things, rather than just taking fire at hormones. You can actually look at the feedback system and where it's broken, or where you just want to tweak it a bit.

The nuances of that ... I've never been more excited in my whole life about the potential there, because we've knocked out most of these now, which we didn't know 20 years ago, and now we're starting to understand the biochemistry, and even some of the electric stuff that's happening there, and saying, "We can change it."

I want to raise my EPO levels, because they're actually a little bit low, which is kind of cool. It turns out that people who are exposed to certain biotoxins in the environment have lower EPO levels, and that can have all sorts of problems for tissue oxygenation, and athletic performance. It's

amazing what small tweaks in the environment can do to a signaling system, and to what happens there. Now I'm all excited about you doing it.

David: Cool. As you mention, that gets into a scary point of endocrine disruptors in the environment. A lot of chemicals that we put into the environment, most of which we know very little about, how they affect human health.

Dave: I really appreciate that you brought that up, too. A big part of the principles behind the [Bulletproof Executive](#) and behind just reaching a state of high performance, whatever your game, is don't expose yourself to these little bits of Kryptonite in the environment when you can avoid it. I fly all the time, I know that I get toxins there; but I don't intentionally smear them on my skin after I get off the airplane, because I don't have to.

Just minimizing harm seems so intelligent, if you recognize the harm in the first place. There's the sort of meathead, thump the chest and say, "If it doesn't kill me, it makes me stronger." Hormesis is accurate, but when something damages your DNA every time you're exposed to it, it actually doesn't make you stronger.

David: Yeah, if it doesn't make you stronger, that's like Orville and Wilbur were flying until they hit the ground kind of thing. Nobody's been able to come back and say, "Well, I guess it did kill me, it didn't make me stronger."

Dave: That's a very fair point. "Oops, I guess I was wrong," and then you hit the wall.

All right, here's our question: Given all of your research, and all of your life, completely apart from your research, your top three recommendations for people who want to perform better at everything, not just at sports. Basically, for people who want to kick more ass at life, what are the three most important things that you'd offer them?

David: I'm going to pick things that I think can spread across all people, so that they're not task specific. More and better sleep; for most people today, I think that means controlling their screens before sleep time. As much focus as we have, I think highly motivated people often don't a problem

with getting themselves ready to train and things like that, but do sometimes in making sure that they, not just as a side thought, but budget in rest and recovery, cognitive and physical, to what they're doing. I think that has to be part of the plan, and is for the lead athletes, where they budget in recovery. Whether it's time to allow physiological adaptation, or time to allow your mind to regenerate. I think those are things to focus on.

Also, I would just preach in general a mindset where whatever you're doing, you look at yourself as a scientific study of N equals one. One of the things in the reporting of the sports gene that blew me away was how truly different we are at the genetic level. There's this quote I love by a guy who was a world class hurdler, and was the world's expert in body growth and development, named J.M. Tanner, that says something like, "Because we all have a completely unique genome for optimal development, we would all have a completely unique environment."

You yourself are testing various things about yourself to find the optimal environment for yourself, and even if we have an identical twin, we have some genetic differences from them. The act of training, or of trying to get good at something, is a biological setup exploration that's beyond even what cutting edge science can tell you at this point, in many cases. I think we need to look at that, and continually self-reassess what works for us, because it might not be what works for the next person.

I know that sounds like a very general point, but that approach worked for me in my training, and I became a better long distance runner at 35 miles a week of certain targeted types of intervals than I had been in 90 miles a week of distance, because I eventually realized that what worked for some other people wasn't working for me, and that made all the difference. I think it can for a lot of other people as well.

Dave: What an amazing point. I had the same thing; I know I weighed 300 pounds, I worked out six days a week, an hour and a half day, I cut my calories to 1800, and I stayed fat. I felt guilty for a long time, because obviously I wasn't trying hard enough, before I hit on that same point you just mentioned, which was if it's not working, it's not working. Try something else. It actually requires a pretty big leap of faith, because, "It's

supposed to work, why isn't it working? What's wrong with me?" There's a whole inner dialogue that happens.

I appreciate you sharing that as one of the top three of your recommendations, because it certainly changed my life to realize, "Wait, I'm just going to go with what works, instead of what's supposed to work."

David: Very well said. That's really one of the main take-aways for me in everything I do now. I'm lucky I had the chance to work on this book, because it gave me insight into those things.

Dave: David, thanks for being on the show. Can you let listeners know, a lot of them are driving and all of them will get access to all these links and they can see the podcast transcript, but let them know the title of your book, where they should go to pick it up, your website, and whatever other coordinates they should know about, to hear about your fascinating work.

David: It's "[The Sports Gene: Inside the Science of Extraordinary Athletic Performance](#)." My site is thesportsgene.com. I'm on Twitter at [@DavidEpstein](#), it's at Amazon and it's at your bookstore. I just added an afterword to the paperback that's out recently.

Dave: I'm going to do something I haven't done before. If you loved this show, and you thought it was amazing, you should actually go into a bookstore and buy the book instead of just buying it online, because, well, the people who sell books really pay attention to that, and as an author of "[The Bulletproof Diet](#)" book, coming out from Rodale December 2nd, big launch, it really matters when people pre-order and when people actually buy in bookstores. Support this kind of work, because it's an awesome book, by going to the bookstore and buying it. If that doesn't work, click "buy" on Amazon, that works too.

David: Thanks for that.

Dave: You got it, David. Thanks again, it's been an awesome show.

David: My pleasure. I appreciate it, it's fun to talk to you. I'd love to hear more about how you found your path sometime, it's really fascinating and obviously the changes that you made to yourself really [inaudible 00:59:49] awesome, just really cool.

Dave: We'll hook up next time I'm in Connecticut.

If you like the show, please do me a favor and go to iTunes and leave a review, and say, "This was good." It's really, really helpful; it'll help David if you liked this episode, and if you like the show, it'll help other people find it. This is one of the ways that the show is number one ranked in the health category quite often, is that people take the time to say thanks. The content's free, there's more than 140 shows now, and I spend a huge amount of time preparing for these, in order to not waste your time when you're driving, when you're listening to this.

Please say thanks, just leave a review on iTunes, let everyone else know that you thought this was worth an hour of your valuable time. Thank you.

One of the things that makes you most bulletproof is the ability to focus. I don't mean focus for a minute or a few seconds; I mean focus for as much time as you need to focus to get the job done. For that, I've trained myself using the upgraded Focus Brain Trainer. By teaching yourself to consciously move blood to the front of your brain, you can teach yourself to focus effortlessly for long periods of time.

I've used this technology extensively myself, and I used it with some of my executive coaching clients, in order to help high performance people become even more higher performance.

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