Huffines Sports Medicine Podcast

Mr. David Epstein from the Huffines Discussion 4

S1 00:00 Hi, this is Tim Lightfoot, the Director of the Huffines Institute for Sports Medicine and Human Performance. I am so excited to let you know that the Huffines Institute now has apps for your smartphones and your tablets. We have apps for the Apple products and for Android products. You can go to iTunes or go to Google Play, either one. Download those Huffines apps and you can pull in our content every week. Now, onto the podcast.

S2 00:26 Welcome to the Sports Medicine podcast, brought to you by the Sydney and J.L. Huffines Institute for Sports Medicine and Human Performance in the Department of Health and Kinesiology at Texas A&M University. At the Huffines Institute, we're always working to facilitate, apply, and bring you the most up to date coverage of the wide world that is sports medicine and human performance, all in a language you can understand and share with your friends. And now, here's our host, the Director of the Huffines Institute, Dr Tim Lightfoot.

S1 00:56 The next speaker has been a friend of the Huffines Institute for several years. He was actually here at Huffines discussion two a couple of years ago. Since then, he's written a book. It's a bestseller. He's gone on, he's done TED talks on the big stage. So please join me in welcoming back to Huffines discussion, Mr. David Epstein.

[applause]

S3 01:20 Howdy.

S4 01:20 Howdy.

S3 01:23 I'm from Brooklyn so that's a novelty where I'm from. I wrote a book about genetics and athleticism, and since then it's become a weekly occurrence that I get a question over email or in person from someone who has a child, asking how to make that child into a legendary athlete. It's a pretty difficult question and I want to show you why with an example. I want you to picture last year's world championships of the 100 meters. It was held in Moscow in Luzhniki Stadium, which you can visualize here. And just picture it. It's 50,000 fans. They're all there to see Jamaican sprinter Usain Bolt, the fastest man in history. Picture this. Flashbulbs popping around the stadium as the nine fastest men in the world coil themselves into their starting blocks. And just humor me for a second and close your eyes and picture the race. It'll be cool if everybody does it. Ready? Bang! The starter's gun goes off. An American sprinter jumps out to the front. Usain Bolt starts to catch him. Usain Bolt passes him, and as the runners come to the finish, you'll hear a beep as each man crosses the line. Hear that? You can open your eyes now. That's the entire finish of the race. That first beep was Usain Bolt. That second beep - raise your hand if you have any idea who that second beep was. Nobody? That second beep was 0.5% behind Usain Bolt. That's the difference between an athlete who's legendary and very valuable and one who's apparently anonymous even in his home country. That fourth beep - that was a guy who was 1% back and he has to have an off season job.

S3 02:51 The difference between that third and fourth beep is the line between professional and having to do something else. So these parents are asking me, "How do we get

that 0.5%?" It turns out to be a really difficult question because that's less than the margin of error of most of what's done in the lead athletics. Listen to it again. Ready? That 0.5%, see if you can distinguish the third and fourth beep, that line between professional and semi-pro. Ready? That's it. That's the kind of differences we're talking about. So it turns out to be a really hard question. How do we get that 0.5%? It depends who you ask.

S3 03:24

Does anybody want to be really brave and tell me what these three things have in common: champagne, razor blades, and diapers? I wouldn't either. What these three things have in common is that if you purchase these three things and only these three things in a convenience store in the United States, you'll get flagged for credit card fraud when you check out. It turns out that this is an incredibly common purchase pattern of identity thieves. Champagne and razor blades are apparently really easy to flip on the black market, and identity thieves buy diapers because it makes them seem non-threatening when they check out. This was discovered by a man who was running a software company that was working with credit card companies to analyze reams of big data and just look for common purchase patterns among credit card thieves. And he got really, really good at that. In fact, this guy got so good at it that he was able to buy the Sacramento Kings of the NBA. And he, like many tech entrepreneurs who are moving into sports ownership and sports management, have great faith in the power of big data to solve their problems because they've had these kinds of successes with big data. Does anybody follow the Sacramento Kings? You know how well that's been going. Just kidding. They need some more time. But I think there's a lot of new faith being placed in big data in sports.

S3 04:32

Meanwhile, we're overlooking what I want to call small data. And I want to give an example of what I mean by small data. And to do that, I'm going to take an example from UK sports. So when the UK was awarded the 2012 Olympics, they poured money into sports science and one of the first things they did was make what they called determinants of performance for every sport. What matters to the outcome of a sport? And they started with really simple sports like shot put. There's only three determinants of performance in shot putt - the release velocity of the shot, the height of release of the shot, and the angle of release of the shot. That's it. Pretty simple.

S3 05:04

The UK sports scientists said, "Well, let's see how this plays out in a competition between the two best guys in the world." So they looked at the height of release. Turned out the guy that got the silver had a higher height of release than the guy who got the gold. Okay, what about the next variable? Well, the guy who got the silver had a better release velocity too than the guy who got the gold so he's probably a better athlete really. But the guy who got the gold threw at one and a half degree higher angle and won the gold medal. So they said, "Now what if that guy who got silver, what if instead of throwing it thirty one and a half degrees, he'd thrown one degree higher, what would have happened?" And instead of throwing 70 feet and 11 inches, he would have thrown 72 feet, 4.5 inches, and he would have alchemized that silver medal into gold.

S3 05:43

They said, "Well, let's apply this to other simple sports. What's another simple sport?" They said, "Long jump." Three determinants of performance - speed down the runway, force into the jumping board, angle of jump. Period. So they hired a PhD biomechanist of which there are precious few in the world and gave her the title of Horizontal Jumps Specialist. How's that for a specialized title? Her job was just to watch research grade footage of jumpers going down the runway, over and over and over and over. Figure out what she could improve. She figured out really quickly she

couldn't change their speed of approach, couldn't change their force onto the board. They already had good technique at that level. But she could change their jumping angle. So she spent two years working just on angle with Great Britain's best long jumper. Come the Olympics, he doesn't have one of the ten fastest approaches into the board, doesn't have one of the five highest forces into the board. Jumps at the perfect angle and wins the gold medal.

S3 06:28 There's an example of using small data. Figuring out not just descriptive variables but what matters and what you can change to get someone that 0.5% and take someone who probably was not the best athlete in their event and get them to that top level, that extra 0.5%. And these kind of findings don't always come out of big data.

S3 06:46 Big data, there's been some great low hanging fruit. But in some cases, sports are drowning in data and being remarkably ineffective at applying those to make people better. Let me give you another example of recent small data from golf. It turns out that what the eye of a putter does before they hit is really, really important. I want to show you what the eye of someone like Rory McIlroy does in the two seconds before he putts. It goes like this. Focuses on the back of the ball - one, two, and then he putts. And that's it. In those same two seconds before the putt, I want to show you what a lesser - when it says amateur, it's like amateur scratch golfers - what the eye of a lesser putter does in those same two seconds. Ready?

[silence]

S3 07:29 It hit six different spots. These are from eye tracking studies. This would never come out of big data, but it turns out that this is something that really matters. It's probably a proxy for calming your brain really than what your eyes are doing. And it's really easy to train. When you tell the golfers who are doing that to stop doing it, they'll say, "What are you talking about? I was looking at the ball. I don't know what you mean." But you can find ways to train it implicitly like putting a word under the ball and making them read the word before they lift their head when they putt, and in two weeks you can take about 1.9 strokes on average off of pretty good amateur golfers. So there again, it's an example of not just finding variables that matter and describe, but things that matter and that you can change.

S3 08:03 But I want to go backward from the 0.5% for a second, because we're already talking about that elite level. That level where it's really hard to discern the difference between people. I think first it's important to get people into the right sport in the first place before we even think about eliteness. And I want to use myself as an example. I played football, basketball, baseball in high school. I know you're surprised I didn't make it to the NBA. This is a picture of me in college when my lower to upper body weight ratio was much more favorable than it is now. I was a walk-on in track and field, which means, of course, I wasn't good enough to be recruited.

S3 08:35 This was my training partner, a guy name Scott, who by the time we were paired together, he was already a national athlete for Canada. You can see him wearing his Canada kit here. We were both 800-meter runners. He was 20 seconds faster than me in the 800 meters when we were both juniors in high school. That's a half a mile, so that's a world of difference. And I think it's kind of custom to put the walk-ons with the blue chip recruits so that the walk-ons don't show up for the second week of practice and basically just disappear. But for whatever reason, I liked the guys I was around and stuck it out and I would do fractions of Scott's workouts. I couldn't do what he was doing, so I would do lesser multiples of it.

S3 09:11 And even doing that, a funny thing started to happen. I started to catch up to him - catch up to him, catch up to him - and I caught up to him at about a minute and 52 seconds in the 800 meters, nearly 30 seconds down from where I was as a junior in high school. I passed him and he never beat me again, and I kept getting better and he sort of stagnated. And an interesting thing happened which was that our coaches and teammates foisted upon me this very flattering narrative that I'm as tough as nails - no talent, just so tough because I kept improving. Yeah, all right [chuckles]. And for Scott, it was totally different. It was he came in with all this talent, he's not improving, he's a head case. So I'd watch him as he would get these pep talks before every race. Like, "You've just got to be calm, man." He was calm - well, he was calm until he started getting pep talks, anyway, before the race.

S3 09:55 So, I always thought there was something kind of wrong. We were living together, eating together, training together when I could keep up, so I always thought there was something wrong with this narrative that I was tougher than him, given that, if anything, he was doing more than me, but I wasn't going to negate this flattering narrative, right? Because it ended in all this really cool stuff for me. Like I won my university's four-year award for the athlete who achieved significant athletics success in the face of unusual challenge and difficulty [laughter]. Pretty cool, but I did always feel like there was something wrong with this. And in the reporting of my book, I started to get a sense of what that was.

S3 10:30 You don't have to pay too close attention to this, but these are the results from one section of the most famous exercise genetics study ever done - The HERITAGE Family Study. In this section, 98 two-generation families were put on five months of identical cycling training programs spread across four different university centers, tightly controlled in the lab for pretty high effort. These are people who had not trained before, and this section of the study was looking at their change in aerobic capacity. Essentially, the amount of oxygen they can move through there bloodstream when they were going as hard as they could, which is a really important predictor of endurance for non-elite athletes.

S3 11:02 And here, you can see the range of improvement. Some people all the way on the left of the graph who didn't improve at all or even got a little worse, which is pretty surprising going from nothing to five months of training. Other people on the right who got way, way better. Most people in the middle got moderately better. This is the spread of people on this identical training. So, in 2011 the scientists doing this work found a genetic predictor set. So, different versions of 21 genes - they could predict who was going to improve in response to this training before they even did it. And some of these genes have now been replicated, but the specific genes don't even really matter. About half of this ability to be trained came down to people's genetics.

S3 11:38 People who had at least 19 of the so-called good versions of the genes improved the amount of oxygen they could move three times as much as the people who had fewer than ten on identical training. Identical training. What I think is even kind of cooler, guess what the correlation between ability at baseline and ability to improve was in this study? Zero, zero. So on day one of the study, the scientists said these are our ten most talented people, and they missed 100% of the people who ended this study looking the most talented. I have been tested both at baseline-- and I have almost all these genes. I'm the classic what you'd call low baseline, high responder. I suck at first and then I get better really quickly. I was actually so bad when I started I went to get it evaluated by a pulmonologist and they said my results were consistent with the earliest stages of emphysema [chuckles]. That's two seasons before I ran at nationals

in the 800 meters.

S3 12:31 Why is this important? Well, I think it's important because before we think about that 0.5% I think it's important because of what we know about how elite athletes are made, or what we think we know about how elite athletes are made. We know that elite athletes spend considerably more time in effortful practice: deliberate practice correcting errors, working to build their capacity than do nearly athletes. No big surprise, right? Well, that's the case when scientists look at them as fully-formed adults. But if we actually look at the entire lifespan of athletes who go on to become elite, they actually practiced less early on than athletes who plateau at lower levels.

S3 13:11 Early on, athletes who go on to become elite, they practice less in their eventual sport, they actually go through what scientists are starting to call a sampling period where they try a range of different sports and activities, gain general physical skills and athletic skills, and, like me, find the niche where they fit. Think about what this sometimes uncorrelated or slightly correlated baseline to trainability means. It means that when we're judging talent, we're always judging what we're seeing right now, whereas in some cases the ability to be trained is turning out to be a more important kind of talent. And, if someone doesn't have the chance to find that niche, if I didn't have the chance to sport sample and find that area where I was trainable, then I would have just been judged as talentless and that would have been the end. These athletes who go on to become elite, it's less the Tiger Wood's stories, more typically the Steve Nash story - the two-time NBA MVP - played a variety of sports, didn't even own a basketball until he was 13. Eight years behind me, worked out okay. Roger Federer's parents forced him to keep playing badminton, basketball and soccer before he focused in on tennis. This is the typical path, but it's not one that you hear in mainstream media stories because it's really not that sexy.

S3 14:18 I want to leave you with this quote I love from J.M. Tanner who was a world-class hurdler and the world's expert in body growth and development. Everyone has a different genotype. Therefore, for optimal development everyone should have a different environment. You don't even have to constrain this quote to genotype. You could say everyone has a different genotype, everyone has different experiences, everyone has different desires - whatever it is. We move toward cookie-cutter programs, toward pushing kids to all do the same thing that imitates what they think a pro-athlete did. Whereas, the exercise genetics is showing us that we really need to spend time finding the environment that's optimal for our completely inimitable genome. And, I think we are systematically stripping that opportunity away from kids because of the direction were going in youth sports. We're just pushing early hyperspecialization because we see they need this 0.5%. We look at those men and women who are getting that 0.5% and then make the kids start imitating them right away, but that's not the developmental path to success. The typical developmental path is a sampling period first, and only then focusing in on what matters and what you can change. Thank you very much [applause].

S1 15:29 Thank you David, excellent job again.

S3 15:30 You're welcome.

S1 15:32 It strikes me, interesting that it's almost like you're applying analytics to every sport now. Analytics has really been big in baseball for many years, and now you're really starting to look at that in other sports.

S3 15:43 Absolutely, and to me, we should be using analytics to try to make people better at what they do instead of just finding interesting descriptors. So, I want to see analytics

move more toward a model where we're helping people find the best fit for themselves and become better as opposed to just describing metrics that are interesting for hall of fame voting.

S1 16:03 Why have we gotten away from that? I mean, there was that big interest in the 60s and 70s when everybody seemed to measure all this stuff and that's kind of-- we've kind of gone away from that in the last 20 years.

S3 16:11 I think some of it-- I mean when I talk to the gentleman who owns the Kings he keeps repeating this mantra, "Math has become more important than science." Right, so if we just get enough data, the answers will pop out and that maybe true for credit card fraud, but I don't think it's true for all forms of skill acquisition in sports.

S1 16:26 So what would you say to those scientists that are pursuing genetic aspects to maybe look at performance and how we can preselect people for better performances when it's as simple as increasing the shot put angle by one degree?

S3 16:40 They're doing genetic work the first thing I would say is, "Stop doing candidate gene studies, association studies." I think yesterday's study was some single gene correlates with college students having better romantic relationships. Trust me, it doesn't. Statistics are terrible and so I would get rid of those studies, start doing-- looking at-- you don't have enough time to criticize me, but looking at gene expression studies to find out what genes might be at play here. But I think we should be having a conversation about it if want to use those to preselect people. My hope is that instead of genetics putting people in a pigeonhole, it will be, "Look, you should do whatever sport." To get that 0.5% you're probably going to need to fall in love with what you're doing anyway, so that's important first. And then, maybe, if you're not having the experience that you want, here's some other training that you might respond to and have a good experience, instead of, "You have to go over here, because you have these genes." Right? Or finding out why everyone here has had a training partner at the gym, or gone on a diet that someone else went on. There are reasons why it doesn't work the same for two people, and those reasons might be the person themselves. So I hope that we use this to tailor people's environments-- the mantra I repeat is: find out what differences between people are real, not just folklore, which are important, and then how to use those to get optimal outcomes for all people. And to me that doesn't mean pigeonholing people before they have opinions about themselves based on their genes.

S1 17:55 Right. Don't label them too early.

S3 17:57 Right.

S1 17:58 So, let me ask one other question - kind of extend - and this is something you've talked about in the past, and you didn't talk about today. What's the effect of technology on these things? You've made a comparison with Jesse Owens in the past.

S3 18:08 Oh, its massive. I would say at this point, in many sports larger differences made by technology than by the athletes themselves. So, one of the really easy examples I like to use is the one-hour cycling record which was set in 70s by Eddy Merckx, and by 1996, bicycle technology - how far you can cycle in an hour - bicycle technology had gotten so much better that the record was five miles further. And then in 2000, the international cycling union declared that anyone who wanted to attempt to have the record had to use the same equipment as the guy in the 70s and now the record's like 800 feet different from what it was in the 70s. So, most of the record was down to technology.

S1 18:44 So, not much change?

S3 18:45 Not much change in some sports, yeah. Although sometimes, there's an interaction. So, if you look at swimming records falling, it dribbles down and there's big cliffs, and one of the major cliffs is the invention of goggles because it allowed athletes to stay in the water and train more. So sometimes, there's an interaction between technology and just natural human progress.

S1 19:03 We'll stop. Thank you David so much for--

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