

Huffines Sports Medicine Podcast
Christie Aschwanden from the HD4

[music]

- S1 00:11 Welcome to the Sports Medicine Podcast brought to you by the Sydney & 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. Now, here's our host, the Director of the Huffines Institute, Dr. Tim Lightfoot.
- S2 00:42 One of the things I think is incredibly important in today's world of increasing complexity of science, is having people that can actually translate that science so people can understand it. We are very fortunate to have, who I think are two of the best young science translators, science journalists in the country with us today, and so our next guest is one of these. I'm pleased to introduce to you Miss Christie Aschwanden. [applause]
- S3 01:08 Thanks, Tim. This question came to me when I was at the most ridiculous trail run that I've ever done four times. I was standing around the finish line, which was this fire pit, drinking a refreshing beer, not this one, but you get the idea. Some of us were standing around drinking beer after the race, and I started thinking, "I wonder if this beer is killing our recovery." I'm a journalist now, but I started off my career as a scientist, and I'm still a bit of an experimentalist. I thought, "Hey, let's do a study." I enlisted my friend Gig Leadbetter, who is an exercise physiologist at Colorado Mesa University, my local school there in Colorado. Then I got Runner's World Magazine, where I'm a contributing editor, to bankroll the project, and then, I would write a story about the project once we were done.
- S3 02:06 This was our study question, "Does drinking alcohol after running impair recovery?" We set up a protocol. I will skip over, in the interest of time, the pretesting that we did. I want to say that there was a VO2 max testing, there was a local cop, there was a breathalyzer involved. We enlisted ten volunteers, five women and five men, and the study took place over three days. The whole project began on day one with the beer run; this was about 5:00 in the afternoon. We brought people in, and they ran for 45 minutes on the treadmill at about 75% of their VO2 max. The idea here was to try and tap into glycogen stores, because again, we're looking at recovery, and we wanted to make sure that this run was sufficiently difficult to require recovery. So, 75% of your VO2 max isn't really hard, but it's not easy either. You can still talk a little bit, but it's not so easy that it's just a walk in the park.
- S3 03:09 After that first beer run, everyone got a pasta dinner, and then, of course, the beers. We used the double-blind study. There was only one person, an undergraduate, who was helping out, who knew which runners got which beer, repeated. Half of them got the real beer on the first run and the other half got it the second run. Our two beers were Fat Tire Amber Ale, very good Colorado beer, that was the alcoholic beer. O'Douls Amber, which its best quality is that it looks a lot like Fat Tire in the cup. Our goal here was to get everyone to about 0.8% blood alcohol content - this is the legal limit for driving under the influence in Colorado. We'd had a cop come in prior, to make sure that we were tabulating this right for everyone. Those were the beers.
- S3 04:04 Everyone came back then, the next morning, to do what's called a run to exhaustion. 80% of the speed that you were running when you hit your VO2 max. The treadmill's

just set at the speed, and people ran until they couldn't go any further, until they were literally exhausted. I should mention here that I was one of the subjects in the study as well; I was one of the designers. That gave me some unique insights into this that I'll get to in a minute. Then that evening we repeated the whole thing again. Everyone came back for the second beer run - 45 minutes at 75% of your VO2 max, more beer and pasta. Next morning, everyone comes back for the run to exhaustion number two. Again, half the people got the real beer the first night, half got it the second night.

S3 04:55

So, we were hypothesizing about whether beer would impact recovery, and there were three things that we were thinking might happen. It might affect readings of perceived exertion, respiratory exchange ratios, which is a way of measuring what kind of fuel people are using. So, if the glycogen stores were depleted, that could affect what kind of fuel they were using. And then third, time to reach exhaustion - how long they were lasting on the run to exhaustion. We didn't see anything with the first two, but we did see a difference in the time to reach exhaustion. What we found is that women ran about 22% longer on their run to exhaustion after they'd had the beer, and then ran about 21% less. Then we did ANOVA analysis of variance and other statistics, and voila. We got a p-value of .03 for the women. We reached statistical significance for the women, not for the men.

S3 05:52

Here's the headline: Beer Boosts Running Performance in Women. Hooray! Great headline. There is nothing, by the way, stopping me from writing this story, except my own skepticism. This is the story I actually wrote. My editors at Runner's World decided that Bart Simpson was the way to illustrate this. Needless to say, my story was not about how great beer is for women. Why? Well, being part of the study taught me a lot about study design and about science. The first lesson that I learned is that study design matters and it matters a lot. This here is Marty, he's an ultra-marathon runner, and he ran for almost an hour on that first run to exhaustion. That happened to be the run after he had had the non-alcoholic beer, and then the following morning he came back and had to do this all again after drinking the alcoholic beer. We ended up designing our study over three days for reasons of availability of the lab, getting our volunteers. There are a lot of practical considerations here, but at the end of the day, it's really hard to know, did Marty run less far on the second run to exhaustion because he was just tired, because he ran really far on the first one, which was the day before, or was it something about the beer? It's hard to say.

S3 07:14

Lesson number two: even accepted protocols warrant scrutiny. We use the run to exhaustion as our test, because it's an established test. It's in the literature, this is what people use to measure this. We didn't make it up. On paper, it looks really great, but I can tell you, as one of the subjects, getting on a treadmill and running at 80% of your max until you can't go any longer, at some point, it really becomes a mental exercise. After the study was done, I talked to all of the research participants and everyone to a one said the same thing, "You know, well, you're kind of going. It's hard. You're kind of bored. It's uncomfortable, but are you really exhausted? Maybe, maybe not."

S3 07:55

Larry, one of the mornings, brought his daughter with him to the lab, and it turns out that on that morning, he went less. He quit the run to exhaustion sooner than he did at the other trial. I talked to him about it later and he said, "Well, maybe I could've gone longer, but my daughter was there and I really wanted to get home." My point here is that there can be a lot of factors that are influencing what results you get, that are not things that are going to end up being written about in the paper. There are things you might not notice if you're not paying attention.

- S3 08:26 Lesson number three: participant expectations matter. Before we began the study, we brought everyone into the lab. There were all these forms they had to fill out about consent and things like that, but someone asked Gig, "This run to exhaustion, what should we expect?" He said, "Well, most people last about 20 minutes." You could guess what happened. We all decided, okay, we got to last 20 minutes. I'm pretty sure that if he had told us 40 minutes, we would've had everyone going about 40 minutes. I know I probably could've gone 40 minutes if that was my expectation. To me, it's very telling that the three people who missed that meeting, were the only ones who lasted less than 20 minutes.
- S3 09:09 Lesson number four: it's not just the protocol, it's how it's carried out. Again, these are things that are not things you're going to consider if you're just looking at papers and things like this. These are practical things of what's actually happening during the study. I just explained to you how everyone was primed to go 20 minutes. On the first trial - the first run to exhaustion - we all had access to and could look at the timer. I know that I was looking at it, I was looking at it a lot. And when you're on a treadmill and you're kind of uncomfortable, the seconds are ticking off really slow and you're really watching it. Talking to everyone - this was a shared experience among all of us - on the second run to exhaustion, the researchers had figured this out and they covered it up with a piece of tape. I have really good eyesight. I could, from across the room, see the clock and I was watching. I know I shouldn't have been watching, but I couldn't help myself.
- S3 10:08 Lesson number five: averages can obscure the real picture. Here's a graph of our results, and the middle line here is zero; you can see that the effect size here is pretty similar for men and women in opposite directions. Again, we didn't reach the physical significance with the men - I'll get to that in a minute - with the women, we did, but you look at the average, and it looks pretty clean cut. When you look at what each person did, it's a little bit less obvious.
- S3 10:37 Cynthia here ran 17 minutes longer after beer. Dan ran almost seven minutes less on his run to exhaustion after the beer. I ran almost five minutes longer. Bryan, a little less than a minute longer. Marty ran 25 minutes, 53 seconds shorter. Again, was that because of the beer or was it because of the longer run the day before? Kara, 4 minutes and 27 seconds longer, and then Larry again 10 minutes and 46 seconds shorter.
- S3 11:14 So, here our data looking on an individual level, the first five are women, the second five are men, you can see they're going in opposite directions. Although overall on an individual basis, we have more people who are doing worse after beer than better. Even though remember if we are looking at our p-value, significant result it's beer is great for women. When you look at it this way, it looks a little more scattered. I was thinking about this a little bit, and when I look at the data like this, I have to wonder, are we really seeing a pattern here or are we just forcing a line through the data? As I was thinking about this, I decided to do another little experiment. I took ten coins, five quarters and five Chilean pesos, sort of like our men and women, and I flipped them. Here's what I got. I got four tails on the quarters, we can call that the women. This looks pretty convincing, "Wow quarters really fall head side down." With the Chilean pesos, maybe it's not as clear cut. You could look at this and it wouldn't be too hard to convince yourself that there's a real difference between the two, except that these are coins and I know that there's probably no compelling reason for quarters to be different, even if we have the p-value.
- S3 12:30 This is lesson number six: p-values don't measure the strength of the evidence. I want to repeat that. The p-value does not tell you whether the hypothesis is true. This is

really important to realize, because it's really easy to find that p-value and decide everything's great, you know what's going on. P-value measures a very specific thing. This is a busy slide, so I'm not going into too much detail about it, but the p-value is really just looking at whether you could be expected to find that result just based entirely on chance. What you really want to know is, is my hypothesis true? Does beer affect running recovery? The p-value can't tell you that. You also have your priors. How likely was it to begin with that this could be a real effect? What are the other kinds of evidence that you have? When you're evaluating the hypothesis, you have to take all of that evidence into consideration.

S3 13:31

That gets me to lesson number seven: beware enthusiasm bias and just so stories. I was totally primed to want to do this study to show that beer is great for runners. I'll be completely honest. I was really hoping that's what it would show, then we got this result, beer it's great for women. What could be more great? I really, really, really wanted to tell that story; I wanted to write that story. I wanted to show it, I wanted the data to show it, but I'm not sure that that's really what happened here. I think it's really important to take a step back and remember that just because a story is compelling, just because a hypothesis is really interesting, it doesn't make it true. You have to be really careful. When I was in college, my anthropology professor had a term for this. It's used in science, called just so stories. These are the stories that you tell to explain your data that are just conjecture. They're not things that you actually know. They're not things you can prove. It's your explanation for what you think you saw. So, he called it just so stories. I think here in Texas it's called bull honkey [chuckles]. So, you have to be really careful to distinguish between your just so story and your data. I realize I'm being a little harsh here. It's absolutely okay to create the story, to think about, "Okay, what could explain what I found?" That's totally okay, in fact it's a good thing to do. Remember, you can't figure out whether your hypothesis is true based only on the p-value, you need to think of all the evidence and creating this story, creating this narrative explanation of your results is how you do that. As you do that, you need to be very careful to differentiate between conjecture and evidence. Be sure that the two don't become co-mingled. When you do this, you realize that you did the study, you had this one simple question. All I wanted to know is, does beer influence recovery? We did the study that was designed the best that we could to answer it, and I still don't have an answer [chuckles]. I wish that I did.

S3 15:47

I think my closing thought here is that it's important to realize that it's very difficult to definitively answer any question in science with a single study, and that's okay. There's a reason that every good paper has the phrase, "More research is needed or more studies are needed." That's a good thing. That's honest [chuckles]. We need to keep that in mind. Then finally, I would say that the time to involve a statistician in your study is not at the end when you have the results and you say, "Oh, go run this through your statistics program and tell me what you find, but please say the p-value is less than .05." No. The statistician should be involved from the very get go. A statistician can help you design the best study that you can to ensure that you have the best chance of answering that question. My time is up here, but I'll just say, you may be wondering, "Okay, what do you think now?" and the answer is, I don't know if it impairs recovery or not, but I know that a cold beer after a hot run, drinking with friends is really refreshing and nice, so, cheers. [applause]

S2 17:00

Thank you, Christie. Great job. I've gotten several text messages here, all with some question about the design of the study.

S3 17:08

Sure.

S2 17:09

But I think that was your point, is that you have to look at the studies and how they're designed to make sure they're designed appropriately to answer the question that

you have.

- S3 17:17 That's correct. That's absolutely correct. The study design is really one of the most important factors of the whole study, and something as a journalist that's the first thing I look at when I'm looking at a study. These just so stories that I was talking about, those tend to be the really sexy things that get journalists to write about things, but oftentimes they are the just so, the bull honkey story. You have to be careful that you don't mistake that for the actual result or the evidence.
- S2 17:45 So, as a journalist, you make a living looking at science?
- S3 17:49 Right.
- S2 17:49 Interpreting science. How many examples of this kind of thing do you see as you start to look at the science?
- S3 17:54 All the time. All the time, and I think it's particularly problematic in sports science studies, because they tend to be small, and I don't mean this as a critique of the field. As I explained with our study, we had very good reasons for doing our design the way that we did, but when I'm looking at it scientifically and trying to interpret the data, I see problems, and I see that we were limited. If we had had a different study design, we might be able to say more, or we might be more surer about some of the things that we can't be sure about because of that design.
- S2 18:23 It comes back to the statement that finding answers sometimes is not easy, is it?
- S3 18:26 No, it's not easy at all. I think that's the other thing. If you're finding easy answers, I'm always a bit suspicious of those [chuckles], because it's rare that you have the yes or no answer. Those sorts of binary results are great, when you can get them, but they're the outliers, they're not the usual case. [music]
- S2 18:46 So, join me in thanking Miss Aschwanden today. [applause]
- S2 18:50 Thank you, Christie.
- S3 18:50 Thanks.
- S1 18:55 The Sports Medicine Podcast is produced by a Alit Letzinger, and licensed by the Huffines Institute at Texas A&M under a creative common 3.0 license. You can share it as much as you want and you can talk or blog about it all you want, just don't change it or charge money for it. This podcast is made possible by support from the Omar Smith Family and the Sydney & J.L. Huffines family. Our music was composed, performed, and graciously provided by Dave Zeltner Productions, your source for quality music and music production since 1992. Find them at www.davidzeltner.com. Our opening and closing credits were provided by johnmilesproductions.com. If you have questions or comments, please send them to Huffines Podcast at hlkn.tamu.edu. From all of us at the Huffines Institute, we hope you have an active and healthy week.
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