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Professor Themanson Studies the Data-Psychology Link in Baseball

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Charlie Schlenker: Professional sports teams have long used data to look at player performances as they grasp any competitive edge. As Illinois Wesleyan University professor wants to help sports teams quantify what they have never tried to measure - how the brain works and how to make it work better. Jason Themanson, chair of IWU's psychology department, Themanson has studied the brain waves of 30 college students, half of them baseball players, to see how their brains respond to a baseball game simulation. He will give a report to Major League Baseball executives during spring training in Phoenix next month. Themanson tells Eric Stock the study tries to capture a player's ability to focus and how that can improve for coaching and repetition.

Jason Themanson: A lot of times in baseball people talk about pay attention, focus, learn from your mistakes and there's no real measure of it, so by measuring neural activity, we can start to get a measure of those psychological processes so players and coaches and teammates can learn more about what they go through and how they're going through processing information to help their performance.

Eric Stock: What does that look like on a spreadsheet?

Themanson: On a spreadsheet, it's a field of numbers. It's an array of numbers but each number represents a portion of neural activity that – that over decades of scientific research has been linked with specific psychological processes like cognitive processing in a tensional orientation and things like that.

Stock: So our focus, our ability to concentrate is being measured in numbers.

Themanson: Yeah. Yeah, we measure your - we use an EEG to measure the electrical activity coming from your brain and we can boil it down to a specific number or an array of numbers that provides a pretty good index of what your brain is doing in relation to either orienting attention or what you expect to have happen when you perform and things like that.

Stock: How do you know that this high-level activity in my brain is I'm waiting for the pitch to come, isn't me thinking about what I had for dinner last night, or you know, an argument I may have had with someone. How do you know that?

Themanson: Yeah, it's a good question because there is a lot of - there's a lot going on all the time, right? So the way we do it - to clean the signal from the noise - is we present a stimulus repeatedly over and over. Instead of looking at one picture, looking at hundreds of pictures and anything locked in time to that pitch will consistently be there, trial after trial after trial. Anything not specific to that process, anything like thinking about dinner, thinking about your job, thinking

about tomorrow, whatever - all that stuff is kind of randomly not locked in time so that noise, in essence, that non-targeted signal, will cancel away the more trials you throw together.

Stock: Would a player who is more focused, would there be - would you see less activity, perhaps, to show that they have blocked everything else out? You always hear about being locked in, being in a zen state, being in a zone, so to speak, athletically, where you are able to block everything out, would it show that?

Themanson: Yeah! Absolutely. That's a possibility where you can be more efficient. You're so locked in and you're so - you've kind of cleared your mind and more is not necessarily better. So in that case you can kind of see efficiency, and the best way to see efficiency is to see individual's neural activity and how it links with their performance and some individuals who are really performing well don't have to do the mental work to get the physical outcome.

Stock: How would you measure that while they are, say, at the plate waiting for pitch to come? They strap to a machine or how do you measure?

Themanson: It's all computerized because to your point earlier, any kind of physical activity is picked up by the brain as well so the current limitation of the technology I guess is they have to sit pretty still so we've created a situation where we were able to capture computerized pitches from the viewpoint of hitter, so they're sitting quietly in front of a computer with the viewpoint of being in the batter's box and they're just responding with the response bat while they have the EEG upon their head so we can kind of really focus in on the neural activity vs - associate with the task vs neural activity associated with moving, swinging, etc.

Stock: So you're going to be presenting this to data analytics people in baseball. What do you expect them to do with this kind of research?

Themanson: I think it's a new frontier. I've been to this conference in the past and they said the one thing that they're missing, the one thing that they can't understand, and it's kind of the state of science, is what the brain is doing and how it does it. So the … hole I thought that this would fill is that it again is a way to measure brain activity. They've moved on to measuring biomechanics. They've measured performance. They have advanced statistical analytics but no one really measures and tries to apply the brain activity, what's going on in the mental side of the game to performance, and this might be a way to quantify some of that language.

Stock: So if you're able to quantify that player A is a more focused player than player B, what do you think that means? Is that something that can be corrected over time, or is that simply a value assessment to say that player A has more value than player B?

Themanson: I don't know if it's a value assessment because there are individual differences that play just like player A is stronger than player B. There might be some individual differences with what we are able to measure but it is definitely trainable and it is coachable so much like you do a physical assessment, you find out that so and so is weak or inflexible compared to his

teammates. So here you could find out that you could really direct and point your coaching, your mental skills training to get player A to focus on whatever you want him to focus on rather than - him thinking he is focusing on, now you have a data point to say that there is room for improvement.

Stock: As we continue on sound ideas, I'm Eric Stock with Jason Themanson, who is at Illinois Wesleyan University. He is the Chair and Professor of Psychology and teaches a sports psychology class at Illinois Wesleyan. He will be presenting a paper at the 9th Annual SABR Analytics Conference in Phoenix, AZ next month that discusses this link, this attempt to extrapolate a player's ability to focus and looking for ways that that could be applied in the game. Now sports have certainly turned it more toward analytics using data, far more advanced statistics not only about their performance but about their bodies and how they use them to drive decisions on who plays, when they play, how they play a particular sport. If you can make the link between that and the psychology, those two things seem to be on parallel tracks but how do they intersect?

Themanson: It is really. Everyone is trying to quantify, quantify, quantify. It used to be – you know, the analytics movement was – scouts used to say someone looks good or someone has a good swing. Well now they measure that. So this kind of sport psychology, people talk about mental skills and mental toughness and now I'm thinking that there might be a better way to actually measure that so it's – it is, to your point, a very parallel track. The psychology of sports seems to be lagging in terms of the more objective or more quantifiable ways to measure these things.

Stock: It almost seems as though these two things wouldn't have that much to do with each other given the fact that if you're looking at analytics, you are almost placing a numerical value on a particular player whereas you are talking about psychology, the study of the mind, there's nothing more human than that so seems as though these two things would be polar opposites.

Themanson: Yeah, there's arts and science at play here, right? And there's a – it's a tingled mess as we all know our minds and how we go through life and it's – and that's why it probably hasn't been measured yet, because it's not easy to measure when someone physically moves something away, you know that they are stronger or weaker but mentally if someone has a larger sense of neural activity or larger index, a larger component of this neural activity, that doesn't necessarily mean it's better, as we mentioned, so there is a lot of art to it but it's a way to not necessarily compare across people, I would think the idealized version would be comparing a person to him or her self over time and seeing if these metrics change over time.

Stock: and how that can be improved

Themanson: exactly and how training or coaching has altered the player to better focus, to better pay attention, to expect more, be more confident, and you can tap into that and say this is working or this isn't working.

Stock: And while the sports world has embraced these analytics for various reasons, not only for determining which player is better but as you said, to seek personal and professional development, what are the applications outside the sports world? There are things that people would argue are far, far more important than this. Could this be used in the corporate world or an education or elsewhere?

Themanson: This type of technology is used in a lot of disciplines and professions. Air traffic controllers have gone through, you know, simulation training and measuring how much attention they can give

because they have to multitask so much. Driving simulators utilize this technology. This technology is utilized for training purposes, for clinical purposes to see exactly what we can measure and get through the self-report errors and stuff selection biases, "yeah, I was paying attention to that" or "yeah, I could manage all of those different tasks," and this is kind of actually, sports is late to the game with some of this application of this technology.

Stock: It does seem that there are a growing number of pro-sports teams that are run by ideally girls, you know who never played sports and that may have been unthinkable a generation ago. You hear things like "Well, the nerds are running the game now," right? And some say that they are ruining the game because they've made it to where all teams are following the same abstract blueprint. What did we make of that as a fan and someone who studies this – what this sort of data-driven approach is doing to change the way we watch sports?

Themanson: There is context. As someone who studies psychology knows that there is no simple answer to a lot of this. It does seem at times, you can be too numbers driven. You can go too far one direction whereas before that, people complained that there were no numbers and it was all subjective. Well now there is still context and there is still merit to the context and the human side of things so baseball's famous for now they have the statistic WAR called Wins Above Replacement and the innovator Bill James behind this analytics movement just recently was talking about how he does not like WAR and you can't minimize the context and the elements in the subjective side of baseball and boil it down to "a number means this player is worth something." So there has to be a happy medium.

Schlenker: That is Illinois Wesleyan University Psychology department Chair Jason Themanson with Eric Stock. Themanson says this work could help inform baseball's next big data movement, injury prevention. He says studying the mental aspect of the game might show how mental fatigue and other psychological stresses could make a player more susceptible to getting hurt.