



Defense Health Agency

Defense and Veterans Brain Injury Center “Clinical Updates in Brain Injury Science Today [CUBIST]” Podcast

“Wearable Sensors to Detect Head Impact”

Episode 104, Transcript

Release Date: July 19, 2017

TRT: 6:45 min

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Inbal Eshel: The views, opinions, and findings contained in this podcast are those of the host and subject matter experts. They should not be construed as official Department of Defense positions, policies or decisions unless designated by other official documentation. Welcome to Clinical Updates in Brain Injury Science Today or CUBIST, a bi-weekly podcast for health care providers about current research on traumatic brain injury, also known as TBI. This program is produced by the Defense and Veterans Brain Injury Center, otherwise known as DVBIC. And I'm your host Inbal Eshel, a speech language pathologist here at DVBIC. As a provider, I know how hard it is to stay on top of the research while managing a full patient schedule, so we're doing the work for you, highlighting current TBI research that can help inform your practice in the time it takes you to walk from your clinic to the hospital. In today's episode, I'll be speaking with Dr. Don Marion, who's a neurosurgeon and senior clinical consultant at DVBIC. In today's episode, Don and I will discuss a study entitled Video Analysis Verification of Head Impact Events Measured by Wearable Sensors. This article was recently published in the American Journal of Sports Medicine. Don, welcome. Tell me what are we going to learn about today? What's the bottom-line upfront?

Don Marion: Sure. Environmental sensors don't always accurately pick up on whether or not you've had a head impact. And by that, I mean like helmet sensors.

Inbal Eshel: Okay, so that's the big picture. And so, now, let's drill down a little bit. So tell me, what types of sensors were they using in this study and what types of forces were they measuring?

Don Marion: So this was a study of high school lacrosse players. And it included both males and females. There were 30 boys and 35 girls. One of the things upfront that you should be aware of is that girl and boy lacrosse is slightly different. Boys' lacrosse involves contact. Girls' lacrosse doesn't. I didn't know that. Anyway, the boys used something called a GForceTracker, which was embedded into their helmets. The girls had the Xpatch sensors, which were attached to the scalp behind their ear. So the girls didn't wear helmets because it's a non-contact sport for girls.

Inbal Eshel: I gotcha. Okay. And so, what were the researchers hoping to learn?

Don Marion: So they synchronized or coordinated video of the lacrosse players with the helmet sensors, so they could tell exactly when the head was hit or the sensor reached a certain threshold level of impact. And then, they could correlate that with video. And in this way, try to determine for sure whether or not there had been a head impact.

Inbal Eshel: I see. Okay. And so, what do you think about these findings? Are there significant limitations that might help color our interpretation of the results?

Don Marion: Well, the findings were that in only 65% of the boys, of the 1,063 impacts that the sensors suggested, only 65% of those impacts were verified on video to be actual head impacts. The remaining were where the sensor was activated while the play had been stopped, the player was along the sideline, or at the end of a goal and the goal

celebration. So it didn't actually indicate an impact. And for the girls, only 32% of them had sensors activated where the video showed that there was an actual impact to the head. So more than 60 or 70%, there was no impact to the head. The bottom line there, I think, is that we have to be careful about how we interpret the sensor data, that it had a pretty high false-positive rate.

Inbal Eshel: So with all of this in mind, what do you think are the implications for the clinicians and the patients out there?

Don Marion: We need to be cautious about how we interpret sensor data. The sensors were introduced probably 10-to-20 years ago now. And at first, they seemed to hold a lot of promise, but as researchers did more and more studies of sensors in both college and high school sports, they realized that, especially helmet-embedded sensors would tell you mostly what the helmet was doing, but not necessarily what the head was doing. And increasingly, that seems to be the case. And so, this study is very, very important in that it does correlate what actually happened by video with what the sensors are telling us. And it tells us that probably sensors are mostly best left for research, at least at the present time.

Inbal Eshel: Are there any other points that you'd like to share before we wrap up today? Any other implications that you can think of?

Don Marion: Well, as they pointed out in the article in the discussion section, the sensor information can be important in certain respects insofar as telling us about multiple impacts. And increasingly, we're learning that people with multiple impacts may be more vulnerable to long-term consequences. So sensors certainly do seem to tell us that. And even if there wasn't a direct hit to the head, even if you were hit hard on the back, for example, or slapped on the back in celebration after a goal, for example, that could have some impact on the brain or on the head. The specific point that they made on video analysis they couldn't confirm a head impact in a substantial portion of these athletes.

Inbal Eshel: Well, thank you so much, Don, for your insights and your interpretation. That's all we have time for today. We hope you enjoyed this quick literature update. You can stay up-to-date on future episodes by subscribing to CUBIST on iTunes, Stitcher or wherever you listen to podcasts. If you have any questions about the podcast or about DVBIC products or programs, or if you have feedback for us, please feel free to email us at info@DVBIC.org. That's info@D-V-B-I-C.org.

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CUBIST is produced and edited by Deborah Bailin and is hosted by me, Inbal Eshel. It's a product of the Defense and Veterans Brain Injury Center led by acting national director, Dr. Thomas DeGaba, and the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury led by acting director, Dr. Richard Stoltz. Thanks for listening. We'll be back in two weeks with Dr. Anne Bunner to explore TBI research that has received significant media attention. [music]