



Defense Health Agency

Defense and Veterans Brain Injury Center “Clinical Updates in Brain Injury Science Today [CUBIST]” Podcast
“Concussion and Football Helmet Safety”
Episode 201, Transcript
TRT: 10:40 min
Host: Betsy Myhre

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Episode 201: Football Helmet Safety Ratings and Risk of Concussion

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Betsy Myhre: 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.

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Myhre: Hi. Welcome to Clinical Updates in Brain Injury Science Today, or “CUBIST,” a 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. I’m your host today, Betsy Myhre. I’m a nurse practitioner in the clinical practice and clinical Recommendations group here at DVBIC.

To kick off the second season of “CUBIST,” I’d like to introduce division chief of DVBIC Capt. Scott Pyne, Medical Corps, United States Navy.

Capt. Scott Pyne: Thanks, Betsy, and hello, listeners. Welcome to the first episode of the second season of “CUBIST.” I’m thrilled to be able to share this podcast with you and just as excited to know you’re out there listening.

The science behind TBI is quickly evolving and care is changing. As a provider myself, I know how challenging it can be to keep up with new research and how it can help us provide the best care for our patients.

That’s why my team here at DVBIC created “CUBIST.” Betsy Myhre, a nurse practitioner, and Don Marion, a neurosurgeon, will be taking turns this season as host and guest. They’re here to tackle the controversial and breaking research on TBI so that you don’t have to. If this is your first time listening, you’re in for a treat. Each episode will cover a peer-reviewed study or new provider tool. In just under 10 minutes, Don and Betsy will take you, the health care provider taking care of TBI patients, through the basic findings and important takeaways from the study.

I hope you’re looking forward to season two as much as I am.

Don and Betsy, back to you.

Myhre: Thank you, Captain Pyne.

In today's episode, I'll be talking with Dr. Donald Marion. Dr. Marion is a neurosurgeon and senior clinical consultant at DVBC. Don and I will discuss a study titled, "Making Football Safer: Assessing the Current National Football League Policy on the Type of Helmets Allowed on the Playing Field." This article was recently published in the Journal of Neurotrauma by [Raymond J.] Colello and colleagues.

Don, hi.

Don Marion: Hi, Betsy. How are you?

Myhre: Good. Thank you for being here. What are the key findings of this study?

Marion: A new helmet safety rating system, uh, was introduced in 2011, and the authors wanted to see how this system impacted what helmets NFL players use. For example, you might think they would pay attention to that system and want to use only the highest rated helmets. The authors also wanted to see if the rating system helped make the game safer. Using publically available game film, the authors identified the make and model of helmets worn by nearly 1,000 players on Week 13 of the 2015–2016 season and week one of the 2016–2017 NFL season. They found that players wore a wide range of helmets with varying safety ratings, uh, and this was influenced in part by the player's position and age. Moreover, players wearing lower safety-rated helmets were more likely to receive a concussion than those wearing higher safety-rated helmets. Interestingly, many players suffering a concussion in 2015 did not switch to a higher safety-rated helmet in 2016. Using a helmet-to-helmet impactor, the authors found that the g-forces experienced in the highest safety-rated helmets were roughly 30 percent less than that for the lowest safety-rated helmets.

Myhre: Does the NFL now require the use of only the highest rated helmets?

Marion: One might think so, Betsy, but in fact, no. During the 2016 and 2017 seasons, two of the most famous active NFL quarterbacks were still wearing helmets with very low safety ratings. The NFL allows each player to use whatever helmet they want during the game. But the results of this study suggest that the current NFL helmet policy puts players at increased risk — or may put players at increased risk — of receiving a concussion as many players are wearing low safety-rated helmets, and those helmets transmit much more of the energy of a, of an impact to the brain than higher safety-rated helmets. Moreover, if a player chooses to wear a low-rated helmet, a collision with a player wearing a highly rated helmet actually results in as much as a 15 percent increase in the g-forces imparted to the head of the player with the highly rated helmet. So not only is a player putting himself at risk by wearing a low safety-rated helmet, but also he may be putting his opponent at risk.

Myhre: Can you explain the helmet rating system for our listeners?

Marion: Sure. In 2011, the STAR, S-T-A-R, evaluation system was developed by Drs. [Steven] Rowson and [Stefan] Duma at Virginia Tech, and the system rated helmets based on their ability to reduce g-forces experienced by the head across a range of impact forces. So a star rating of 1 (or worst) to 5 (or best) was assigned to helmets from different manufacturers based on data derived from a helmet drop assay. So, what did this assay look like? Well, helmets containing instrumented head forms would be suspended on the ends of pendulum arms that opposed each other, with the front of the helmets facing each other, and dropped as much as 8 feet or so until they would collide head-on at the low point of the pendulum. The authors found that g-forces sustained by the headforms in 5-star-rated helmets were 30 percent less than those sustained by 1-star rated helmets.

Myhre: How much greater of a risk for concussion did players actually encounter who wore 1-star helmets?

Marion: So, the way the data is presented. Betsy, is a little bit confusing, but essentially they found that of the 44 percent of players who wore a 5-star helmet, only 29 percent of those players sustained a concussion that year. Of the 1.7 percent of players who wore a 1-star helmet, 3.4 percent suffered a concussion. And a statistical analysis of this data confirmed a significant association between the star rating of the helmet and the risk of concussion.

Myhre: So, other than safety rating, what factors were found to most influence which helmet the player used?

Marion: It appeared that the two most common factors were the player's age and the position the player played on the field. Helmets that were originally introduced three to four decades ago were those with the lowest ratings but also those also preferred by the oldest players. Wide receivers and safeties preferred one brand of helmet for a wider range of visibility, while defensive and offensive linemen weren't as concerned about that characteristic and preferred a different brand of helmet. Now, fortunately, in those cases, both were 5-star rated helmets.

Myhre: Don, what are the limitations of this study?

Marion: There are two minor limitations, Betsy. Data on player helmet selection were derived not from all 1,696 active players in the NFL but only approximately 60 percent of the players. And this was because during the observation weeks, some players were injured, not needed by the coach, or unavailable for play. In some instances, players that did see limited time on the playing field, were outside of camera view. In other instances some helmets could not be identified for players wearing team helmets that were dark in color. Efforts to obtain this information directly from the NFL teams were unsuccessful. Additionally, players may choose to have the inner liner of their helmet customized for better protection and thus changing the estimated star rating.

Myhre: What should providers take from this study?

Marion: By far the most important point of this report is that helmets with a 5-star safety rating were actually shown to reduce the risk of concussion. And this is a relatively new finding. Reports I'm familiar with in the past have never been able to show anything other than a reduction in risk of scalp lacerations, skull fractures, or penetrating injury. So, this is really, I think, one of the first studies to suggest, uh, an actual reduction in risk of concussion based on, uh, the quality of the helmet.

A second intriguing point of the study was that players wearing a 1-star helmet can actually cause more injury on impact with a player wearing a highly rated helmet than two players that collide who are both wearing highly rated helmets. This likely is due to an increased stiffness of the shell of the low-rated helmet. So, players wearing a low safety-rated helmet are not only putting themselves at greater risk for concussion but also other players on the field.

While NFL players currently have the option of not using the safest-rated helmet, college, high school, and more junior football teams can enact regulations to be sure that only the safest helmets are provided to their players. Unfortunately, helmets with the highest safety ratings are also those that cost the most, so this turns out to be an important practical limitation for many school districts. On the other hand, the helmet with the lowest safety rating has not been available to the general public since 2010. Uh, it is only sold to the NFL.

Myhre: Thank you so much Don for your insights. 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, where you can also find links to the articles we discuss and other relevant resources.

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“CUBIST” is produced and edited by Dr. Deborah Bailin and was hosted today by me, Betsy Myhre. It is a product of the Defense and Veterans Brain Injury Center, led by division chief Capt. Scott Pyne, Medical Corps, United States Navy.

Thank you for listening to this episode. Next time, we will discuss TBI research getting attention in the mainstream press.

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