Virginia Tech announces 2013 football helmet ratings: One more added to the 5 star mark

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Testing the various football helmets for their ability to reduce the risk of concussions, from left to right, are: Steven Rowson, an assistant professor, and Stefan Duma, the Harry C. Wyatt Professor and department head, both of the Virginia Tech-Wake Forest School of Biomedical Engineering and Science. Credit: Virginia Tech

Virginia Tech released today the results of its 2013 adult football helmet

ratings, designed to identify differences between the abilities of helmets to reduce the risk of concussion. A total of four helmets achieved a 5 star mark, which is the highest rating awarded by the Virginia Tech Helmet Ratings™. The newly redesigned Xenith X2 joined the Riddell 360, Rawlings Quantum Plus, and Riddell Revolution Speed as the only helmets with a 5 star rating.

Two additional new helmet models introduced this year, the SG Adult Helmet and the Schutt Vengeance, were rated as 4 star helmets, denoted as very good. This category includes six existing helmets that have been rated with 4 stars in the 2012 Virginia Tech Helmet Ratings: Schutt ION 4D, Rawlings Impulse, Xenith X1, Riddell Revolution, Rawlings Quantum, and Riddell Revolution IQ. The complete ratings are publicly available online so that consumers can make informed decisions when purchasing football helmets.

The Virginia Tech Helmet Ratings for adult football helmets was created in 2011 based on research that included analysis of over 2 million head impacts recorded in high school and collegiate football games. The process used for evaluating helmets involves mapping the on-field exposure to laboratory tests. For each helmet model, 120 impacts are performed at multiple locations and impact energies. The exposure and impact data are then combined and compared to concussion risk using the STAR equation, an acronym for the Summation of Tests for the Analysis of Risk. Helmets that better manage the impact energy will result in lower head accelerations and thereby lower the risk of concussion. To date, 18 helmet models have been evaluated through the analysis of over 2000 laboratory tests.

"It is encouraging to see the progress in helmet design over the past two years. We were able to utilize funding from the National Institutes of Health (NIH) to collect data that provided the foundation for this translational research. In addition to the high performing Riddell and

Rawlings helmets of last year, you saw Xenith, SG, and Schutt all introduce new helmets this year that are performing very well," said project director Stefan Duma, the Harry C. Wyatt Professor and Department Head of the Virginia Tech – Wake Forest School of Biomedical Engineering and Sciences (SBES).

As observed in previous years, cost was not associated with performance, as the most expensive helmet was not the best performer. "Overall, we recommend players select one of the 4 or 5 star helmets. The specific helmet a player chooses will be dependent on additional factors such as a fit and comfort," said Duma. The other new helmet model introduced in the 2013 ratings was the Schutt Air XP Ultralite, which earned a 3 star rating. The remaining five football helmet models were rated with 3 stars or less.

"It's great to see manufacturers tweaking their current helmet models to reduce head acceleration. When you consider the millions of athletes participating in organized football, selecting helmets that reduce head acceleration can have a large impact across the sport," said Steven Rowson, assistant professor of biomedical engineering at Virginia Tech. Rowson was responsible for the development of the STAR Evaluation System and testing the helmets. "Three of the four new helmet models introduced in this past year earned a 4 or 5 star rating. This helps demonstrate that a data-driven approach can be utilized to optimize helmet design to reduce concussion risk," he said.

These will be the last ratings based solely on linear acceleration, as the research team announced their five year plan that will add rotational acceleration to all future Virginia Tech Helmet Ratings™. Concussion risk will be determined from both linear and rotational head accelerations using methods developed in their recently published study in *Annals of Biomedical Engineering*. "All head impacts result in linear and rotational head accelerations, and starting this fall, we will include

both in our evaluation of adult and youth football helmets. We will also apply these methods to other sports, including: hockey, lacrosse, and baseball," Duma added.

The Virginia Tech Helmet Ratings are independent of any helmet manufacturer and utilized funding from private donations, the School of Biomedical Engineering and Sciences, and the Institute for Critical Technology and Applied Science. Detailed downloadable reports that outline the methodology and resulting data are available on the web site http://www.SBES.vt.edu/nid.

"It is important to note that no helmet can prevent all concussions. The most effective strategies to reduce concussions in sports involve modifying league rules and player technique to limit exposure to head impacts," Duma said. "Beyond this, head impacts are a given in sport. Our research focuses on identifying helmets that reduce concussion risk so that athletes can make informed decisions based independent data when purchasing equipment, which in turn, incentivizes helmet manufacturers to design helmets that better reduce head acceleration."

Provided by Virginia Tech