

Some youth football drills riskier than others

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Virginia Tech researchers lined each helmet with six spring-mounted sensors to measure head acceleration and transmit the data to a computer on the sidelines. Credit: Virginia Tech

Nearly three quarters of the football players in the U.S. are less than 14 years old. But amid growing concern about concussion risk in football, the majority of the head-impact research has focused on college and professional players.

Researchers at Virginia Tech are changing that. A new study published in the *Journal of Neurosurgery: Pediatrics* suggests that limiting tackling drills in [youth football](#) practices could significantly reduce [players'](#) exposure to serious head impacts.

"There are more than three million youth football players in the U.S., but there's almost no research on this population. We believe that it's possible to engineer safer sports at every level, but first you need the data. There's an opportunity here to really make a difference," said Stefan Duma, the Harry Wyatt Professor of engineering in the College of Engineering and a world-renowned expert on injury biomechanics, who led the research. Duma is also

the interim director of the Institute for Critical Technology and Applied Science.

This is the first study examining which activities at youth football practices are associated with the highest risk of head impacts.

"If you know what scenarios carry the highest risk, you can start to design interventions based on that data," said Steve Rowson, an associate professor of biomedical engineering and mechanics and an author of the paper.

Duma and Rowson followed 34 nine- to 11-year-old players on two Blacksburg youth football teams. The players wore helmets lined with spring-mounted accelerometers, which allowed the researchers to measure head acceleration.

Over 10 games and 55 practices, these instrumented helmets recorded thousands of head impacts, and video footage showed what activity led to each one.

The data showed that some practice drills carried much higher risks of head impacts than others.

Of the strongest 10 percent of impacts the players received, the majority occurred during tackling drills—even though the players spent relatively little practice time on these.



As football season starts up again, Duma and Rowson are continuing their research in Blacksburg, and collaborators at Wake Forest University and Brown University are collecting data on additional youth teams. This larger data set will allow the researchers to study how practice structure and head impact risk varies from team to team.

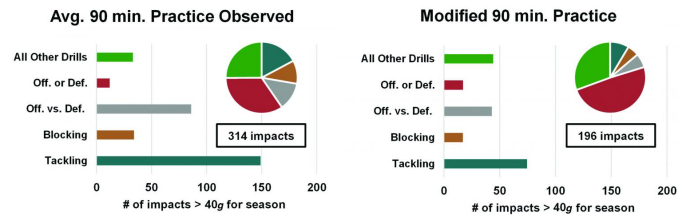
Most football players in the US are less than 14 years old, but they can hit their heads just as hard as older players. Virginia Tech researchers are studying when youth players are most likely to receive serious head impacts, to make sports safer at all levels. Credit: Virginia Tech

The drill with the highest rate of head impacts was King of the Circle, a tackling drill in which a ball carrier rushes at defenders on the perimeter of a circle. On the other hand, offensive and defensive drills had the lowest rates of head impact—and resemble actual game play more closely than isolated tackling drills like King of the Circle.

Over the course of the season, the youth players experienced more high-magnitude impacts in practices than they did in games—in contrast to college and professional players, who sustain more serious hits during games.

This means that changing the structure of youth football practices could substantially reduce young players' exposure to dangerous head impacts. While there is no established threshold in youth players for a level of impact that puts a player at risk of a concussion, harder hits are more likely to cause injury.

Based on the results of the study, Duma and Rowson suggest that eliminating the King of the Circle Drill, and reducing the amount of time spent in tackling drills in general, could make practice safer for youth athletes.



In each 90-minute practice session, teams spent an average of 50 minutes practicing drills. A 10-minute reduction split between Tackling, Blocking, and Offense vs Defense drills would result in a 38 percent decrease in high-magnitude head impacts over the course of the season. The pie charts represent the proportion of the 50 minutes on average of practice time that were spent in each drill. Credit: Copyright 2016 AANS.

This research is part of a five-year project funded by the National Institutes of Health to track head impact exposure in children, the largest study yet on head impacts in youth football.

Duma and Rowson share their conclusions with the youth teams who participate in the study, which has sometimes inspired coaches to change the way they structure their practices.

"Without the data, you don't know," Rowson said. "Doing studies like this provides an opportunity to make data-driven decisions that can ultimately lead to less risk. You don't need to completely change the game of football to improve safety."

Duma and Rowson lead Virginia Tech's helmet research lab, which has won international recognition for evidence-based ratings of football and hockey helmets that give athletes, coaches, and parents the information they need to choose helmets that best reduce concussion risk. This

year, the lab is adding bicycle helmets and soccer headgear to their testing program.

More information: Campolettano ET, Rowson S, and Duma SM: Drill-specific head impact exposure in youth football practice. *Journal of Neurosurgery: Pediatrics*, published online, ahead of print, August 23, 2016; DOI: 10.3171/2016.5.PEDS1696.

Provided by Virginia Tech

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