Study finds association between head impacts and imaging changes in youth football players

15 June 2021

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With preseason football training on the horizon, a new study shows that head impacts experienced during practice are associated with changes in brain imaging of young players over multiple seasons.

The research, conducted by scientists at Wake Forest School of Medicine and the University of Texas Southwestern, is published in the June 15 issue of the *Journal of Neurosurgery: Pediatrics*.

"Although we need more studies to fully understand what the measured changes mean, from a public health perspective, it is motivation to further reduce head impact drills used during practice in youth football," said the study's corresponding author Jill Urban, Ph.D., assistant professor of biomedical engineering at Wake Forest School of Medicine.

The purpose of the study was to examine changes in head impact exposure (HIE) pre- and post-season in a group of 47 athletes who participated in youth football for two or more consecutive years between 2012 and 2017. None of the 47 youth athletes sustained a clinically diagnosed concussion during the study period.

A group of 16 youth athletes who participated in non-contact sports, such as swimming, tennis and track, served as the control group.

Pre- and post-season MRIs were completed for both groups of study participants using diffusion tensor imaging (DTI), a type of neuroimaging that can be used to assess the integrity of the brain's white matter, indicating possible sites of injury.

In addition, the research team gathered biomechanical data of linear and rotational head accelerations of head impacts from the football group during all practice and games via the Riddell Head Impact Telemetry System in the helmets. That information was transmitted in real time to a sideline data collection field unit for later analysis.

In 19 of the 47 youth football athletes, brain images were obtained pre- and post-season for two consecutive football seasons. Using data from the DTIs and the head impact telemetry system, the researchers found variations in head impact exposures (i.e., the number and severity of head impacts measured) from year-to-year and between athletes. For example, in an examination of data from three consecutive seasons, some youths experienced more impacts in their second year of play than in their first, while other youths experienced fewer impacts in later years of play.

"We observed variability in the amount and direction of imaging changes in the brain related to the amount of exposure that the players experienced on the field," Urban said. "If we can

take efforts to reduce that exposure on-field, we can potentially mitigate changes in brain imaging.

"Our findings further support ongoing efforts to reduce the number of head impacts in football practices. In an upcoming study, we plan to engage stakeholders in the youth football community to develop and test practical solutions informed by the data we collect on the field to reduce head impacts in practice."

More information: *Journal of Neurosurgery: Pediatrics*, thejns.org/doi/full/10.3171/2021.1.PEDS20586

Provided by Wake Forest University Baptist Medical Center