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Study finds brain differences in athletes playing contact vs. noncontact sports

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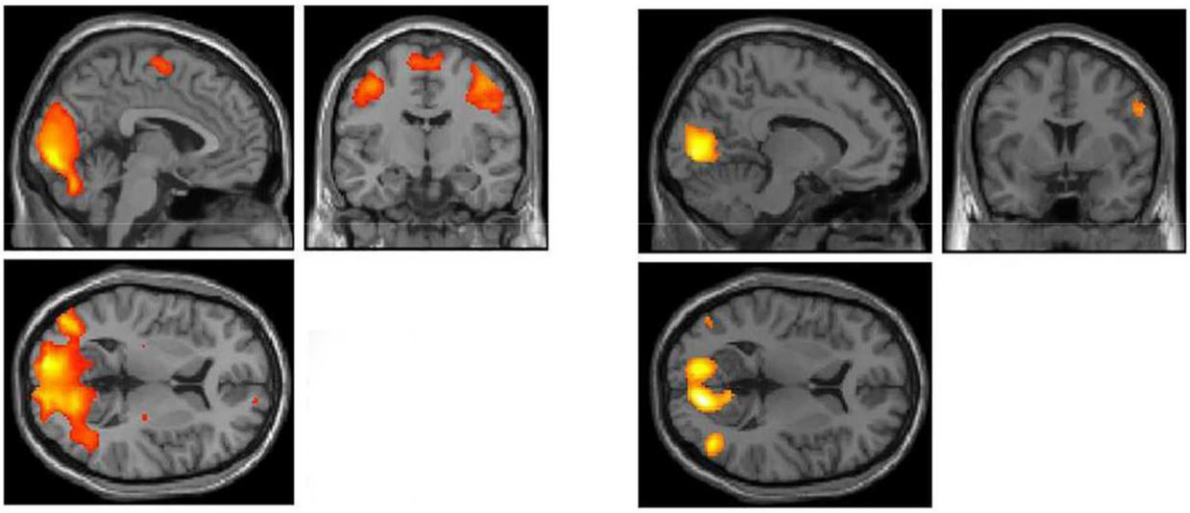

The brains of football players, left, showed significantly higher areas of activation when presented a visual task compared to the brains of cross-country runners, right, who are not typically exposed to subconcussive blows to the head. Credit: Nicholas Port, Indiana University

A study from researchers at Indiana University in the journal *NeuroImage: Clinical* has found differences in the brains of athletes who participate in contact sports compared to those who participate in noncontact sports.

The differences were observed as both groups were given a simple visual

task. The results could suggest that a history of minor but repeated blows to the head can result in compensatory changes to the brain as it relates to eye movement function. Or it could show how the hundreds of hours that contact sport players spend on eye-hand coordination skills leads to a reorganization of the brain in the areas dedicated to eye movements.

While more research is needed, senior author Nicholas Port said the findings contribute important information to research on subconcussive blows—or "microconcussions"—that are common in sports such as football, soccer, ice hockey, snowboarding and skiing. Interest in subconcussions has grown significantly in recent years as the long- and short-term risks of concussions—or mild traumatic brain injury—have become more widely known and understood.

"The verdict is still out on the seriousness of subconcussions, but we've got to learn more since we're seeing a real difference between people who participate in sports with higher risk for these impacts," said Port, an associate professor in the IU School of Optometry. "It's imperative to learn whether these impacts have an actual effect on cognitive function—as well as how much exposure is too much."

To conduct the study, Port and researchers in the IU Bloomington Department of Psychological and Brain Sciences scanned the brains of 21 football players and 19 cross-country runners using fMRI technology.

The researchers focused on these sports because football is a physical game in which small but repeated blows to the head are common, whereas cross-country is extremely low risk for such impacts. The contact sport players did not have a history of concussion, but these sports are known to lead to repeat subconcussive blows.

Port is also a lead researcher on the development of portable eye-tracking technology that could be used on the sidelines of sports events to immediately assess athletes for concussion following impact. Credit: Indiana University

The researchers also scanned the brains of 11 non-college-level athletes from socioeconomic backgrounds similar to the football players to ensure their scan results were not rooted in factors unrelated to their sport.

The differences in football players' versus cross-country runners' brains were specifically seen in regions of the brain responsible for visual processing. These regions were much more active in football players versus cross-country runners or volunteers who did not play college sports.

"We focused on these brain regions because physicians and trainers regularly encounter large deficits in players' ability to smoothly track a moving point with their eyes after suffering an acute concussion," Port said.

Although there were clear differences between the brains of the football players and the cross-country runners, Port said interpretation of the study's results is challenging.

"Everyone from musicians to taxi drivers has differences in brain activity related to their specific skills," he said. "The differences in this study may reflect a lifetime exposure of subconcussive blows to the head, or they could simply be the result of playing a visually demanding sport where you're constantly using your hands and tracking the ball."

The ideal way to find the root cause of these differences would be a similar analysis using only football players, he said. The next generation of wearable accelerometers to measure physical impact during play will greatly enhance researchers' ability to confidently sort players of the same sport into groups based on exposure to subconcussions.

More information: Derek Kellar et al, Comparing fMRI activation during smooth pursuit eye movements among contact sport athletes, non-contact sport athletes, and non-athletes, *NeuroImage: Clinical* (2018). DOI: 10.1016/j.nicl.2018.01.025

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