# Jarring study: Football players with concussions need extended timeout

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This photo, taken April 19, 2013, shows former Detroit Lions quarterback Eric Hipple undergoing an MRI on his brain in Detroit, Michigan. Photo: AP/Paul Sancya

National Football League players have been in the spotlight recently for a reason other than football: cases of long-term traumatic brain injury. However, concussions — a common head injury that can change the way a brain functions — in daily sports among the rest of us are still often treated as temporary.

There is a lot of evidence to back up this way of thinking. Numerous studies have shown that although players might experience headaches, difficulty balancing and memory or thinking problems immediately following an impact to the head, these symptoms usually disappear in a week or two. According to the current medical guidelines for treating concussions, the athletes should then be considered fully recovered and allowed to return to their previous level of activity.

However, an unsettling new study out of Wisconsin questions this medical advice.

Researchers studied detailed brain scans of 18 high school and college football players ages 15 to 21 in Wisconsin. They reported that all of the student athletes who experienced a concussion continued to have visible damage in their brains six months after the injury. All of these players were deemed recovered in seven to 10 days; yet the signs of

neurological damage persisted long after they stopped having clinical symptoms of concussion. The researchers will present these findings at the American Academy of Neurology conference.

## Preliminary Results Look Ominous

Michael McCrea, director of brain injury research at the Medical College of Wisconsin in Milwaukee and the senior author of the study, said that the results are not yet final, given the small sample and short follow-up period. Still, "the findings generally add to the growing body of science to suggest that the tail of physiological recovery after concussion extends beyond the time point of clinical recovery," he said.

The study was partly funded by the National Institutes of Health (NIH) and the U.S. Army Medical Research and Material Command. It involved the use of advanced MRI scans called diffusion tensor imaging and diffusion kurtosis tensor imaging to look at changes in the brain's white matter. White matter consists of bundles of nerve fibers that are considered the connective tissue of the brain. These fibers help to carry messages from one region of the brain to another. Studies have shown that white matter may appear changed in all kinds of diseases and conditions, including stroke and Alzheimer's.

McCrea and his coworkers noticed something unusual in the student athletes with concussions. They had less water movement, also known as diffusion, shortly after their injuries as compared with other non-concussed players. This suggests that the white matter tracts might be slightly torn and leaky. Researchers also found that these small structural changes in the concussion group were still there six months after the injury.

## Follow-up Studies Needed

Some of the students in the study had a previous history of concussion, but for others it was the first concussion they experienced. McCrea said that the group was too small for an analysis of whether this previous history made a difference. He hopes to explore such questions in follow-up studies. The athletes in the current study will be followed for two years, and researchers would like to recruit more participants.

This research may one day be able to shed some light on whether some athletes may be returning to sports too quickly.

"We want to know not only when is the athlete ready to return to an activity functionally, but when is their brain ready to return physiologically," McCrea said in an interview.

The study raises a scary possibility that the effects of even a single concussion could be permanent. James R. Couch, a professor of neurology at the University of Oklahoma Health Sciences Center, is known for his studies on brain injury in U.S. military veterans. He cautioned that it is too soon to make that leap.

## Some X-Rays Could Be Deceiving

"There is not a direct 1-to-1 correlation between the anatomical appearance of the brain and the way a person performs," Couch said in an interview. That is, even if images of the brain show white matter changes, the person could feel and act like his old self.

Couch said it's important to remember that although the brain might be fragile, it also bounces back from injury incredibly well. He said that to really look at the permanence of injuries we would need to have studies that look out 20, 30, or even 40 years after an injury.

"The brain is a tremendously plastic organ in terms of being able to wire around damage and change things rapidly," he said.

He said that if you think of the brain as a type of intelligent, living electronics system, the way it survives is by "constantly reaching out and making new connections."

"The result may be that they sometimes don't produce as good of a result as the original equipment, so to speak, but in other cases it may be it's good enough," Couch said.

## Quiz

1 Read the quote from the section "Some X-Rays Could Be Deceiving."

> *"The brain is a tremendously plastic organ in terms of being able to wire around damage and change things rapidly," he said.*

What does the use of the word "plastic" suggest about the brain?

(A) that the brain is an organ that is able to alter itself

(B) that the brain is made out of manmade material

(C) that the brain is easily damaged by bumps like a concussion

(D) that the brain is easy for scientists to understand

2 Read the sentence from the introduction [paragraphs 1-4].

> *All of these players were deemed recovered in seven to 10 days; yet the signs of neurological damage persisted long after they stopped having clinical symptoms of concussion.*

The author uses the phrase "clinical symptoms" to mean:

(A) side effects

(B) lingering memories

(C) misunderstandings

(D) medical signs

3 Read the final five paragraphs of the article. Why does the author choose to conclude the article with these paragraphs?

(A) to highlight an alternative point of view to the main perspective of the article

(B) to describe a phenomenon that was little discussed in earlier parts of the article

(C) to offer advice to readers hoping to learn more information about the article's topic

(D) to give a critique that shows the author's perspective on the main topic of the article

4 Read the paragraph from the section "Preliminary Results Look Ominous."

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Why does the author include this paragraph in the article?

(A) to provide the reader with information about the structure of the brain

(B) to highlight the importance of wearing protective headgear during contact sports

(C) to discuss the differences between professional athletes and student athletes who suffer from concussions

(D) to present findings of how the brains of athletes who have suffered from concussions have changed

## Answer Key

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