frontiers FOR YOUNG MINDS

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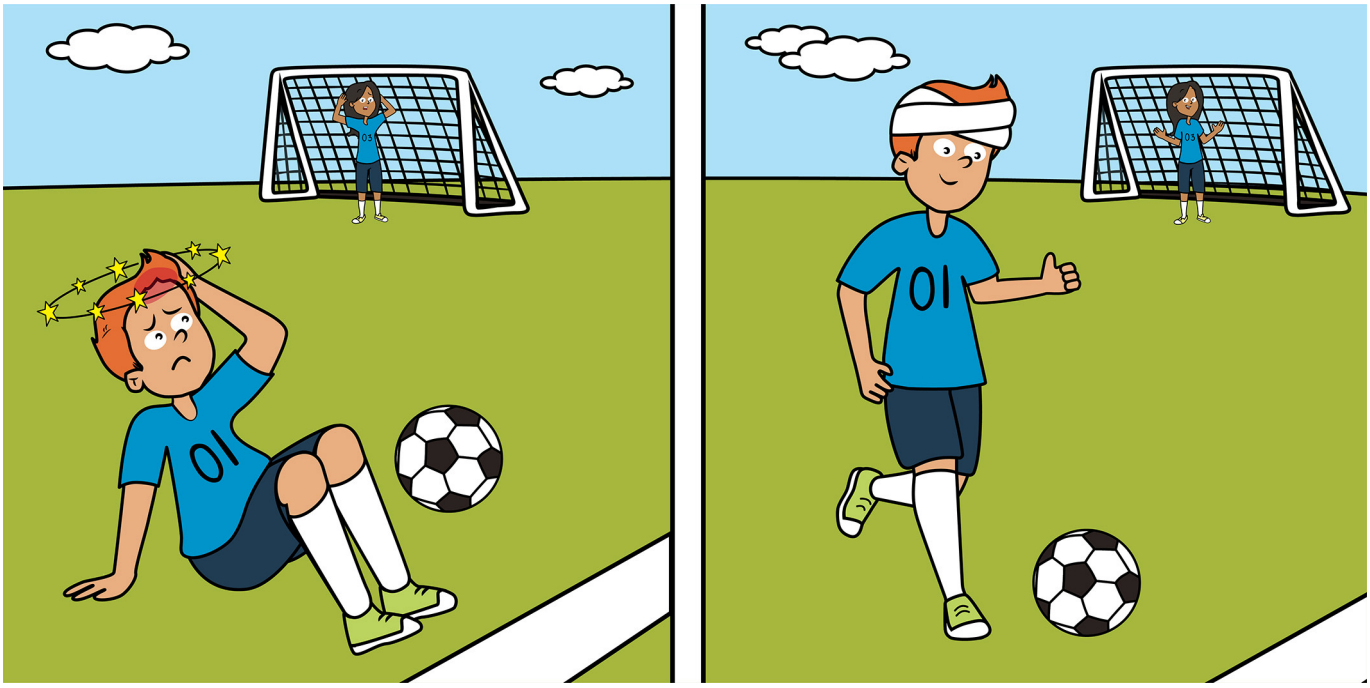

RETURNING TO SPORTS AFTER A HEAD INJURY

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YOUNG REVIEWERS:


HENRY
AGE: 11


JAMES
AGE: 10


MATTHEW
AGE: 9


RONAV
AGE: 9


VIHAAN
AGE: 10

When most people think of a sports injury, they picture a broken leg or arm. However, concussions and other head injuries are also common. Head injuries can cause physical issues like bruising and bleeding and can also cause issues like memory problems. Because every athlete recovers differently, it is best to use guidelines for their return to play. Head injuries can have long-term effects on an athlete's mental health. This article will discuss the impact of and recovery from head injuries, and how athletes can safely return to sports.

INTRODUCTION

Imagine watching an American football player when the following situation unfolds: 3 min left in the game, and—thump!— the player crashes into the ground, headfirst. He passes out and his head is bruised and bleeding. Medics rush to the injured player. Fans around the stadium hope the player does not have an injury that ends his career. Everyone is thinking, "Will he ever be able to play again?"

Most people are familiar with the feeling of hitting one's head. Some sports, like American football, boxing, and football, require a lot of contact. In these sports, athletes may suffer from **concussions** and other severe head injuries (Figure 1). In the short term, head injuries can result in physical injuries, which include bleeding, headaches, and swelling. Concussions also impact other aspects of health, causing short- and long-term symptoms [1]. Besides concussions, other head injuries include breaks in the skull bone and bleeding beneath the skull. These head injuries are typically more severe and require a hospital stay for recovery. This article will discuss the impact of and recovery from head injuries. We will also look at how athletes can safely return to playing sports after a head injury.

CONCUSSION

A type of head injury caused by a direct impact or abrupt back-and-forth movement of the brain. It can lead to temporary loss of normal brain function.

HOW DO HEAD INJURIES AFFECT BRAIN FUNCTION?

NEUROCOGNITIVE

Relating to or involving cognitive functions within the nervous system.

NERVOUS SYSTEM

The body system that includes the brain, spinal cord, and nerves. The nerves collect information and send it to the brain, which creates a response, controlling everything we do.

Head injuries can affect a person's **neurocognitive** functions. First, let us break down the word neurocognitive. "Neuro-" refers to the nerves and nervous system, which control everything we do. "Cognitive" refers to intellectual activities, like thinking, reasoning, and remembering. Putting these two words together results in "neurocognitive," so neurocognitive functions are the cognitive functions relating to the **nervous system**.

Concussions usually affect neurocognitive tasks, including learning, memory, and attention. Athletes who have experienced mild, moderate, or severe head injuries may become worse at these tasks [1]. The variety of symptoms makes it hard to know when it is safe for an athlete to return to the field. As a result, researchers have started to perform tests to measure cognitive abilities after a head injury. These tests allow researchers to identify the short-term and long-term effects of concussions on an athlete's cognitive performance [1].

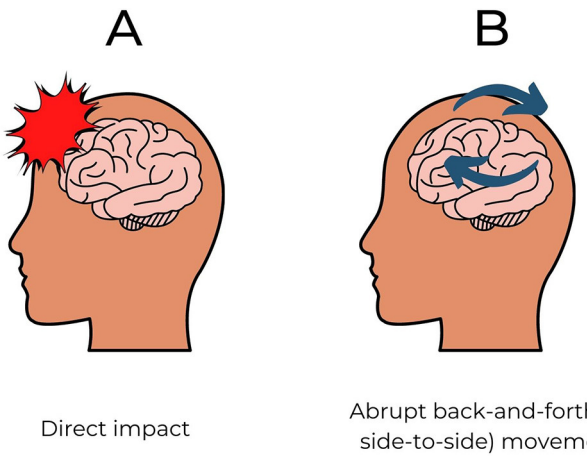

Figure 1

There are two main causes of concussions. **(A)** Concussions can occur from a direct impact (hit) to the head. This can occur by head on collisions between two players. **(B)** Concussions can also occur from sudden back-and-forth (or side-to-side) movements of the head. This might happen when the ball hits a player's head and causes a rebound which leads to a repetitive motion.

WHAT ARE SOME LONG-TERM EFFECTS OF HEAD INJURY?

Let us look at the long-term effects of head injuries on athletes. When athletes have repeated hits to the head, they may develop illnesses. These illnesses can affect them and their sports performance, potentially for the rest of their lives.

Junior Seau was an American football player for the New England team. He was born on January 19, 1969 and passed away on May 2, 2012. During his football career, he had many head injuries. These injuries affected his **mental health** and contributed to his death. His family donated his brain to the National Institutes of Health (NIH). NIH is a government agency focused on advancing scientific research. After studying his brain, the scientists confirmed that he had **chronic traumatic encephalopathy** (CTE) [2]. CTE is a long-term effect of single or repeated hits to the head. CTE can affect athletes who play any type of contact sports, including American football, football, basketball, and rugby. For example, a basketball player who hits his or her head against the court may suffer from a concussion or CTE. CTE causes physical changes in the brain that can only be diagnosed after death. These changes include abnormal protein shapes, a smaller brain size, and even nerve damage (Figure 2). Researchers at Boston University CTE Center are currently working on using PET scans (performed using a machine like an X-ray machine) to diagnose CTE in living people![1] There are some known symptoms of CTE, including headaches and behavior changes. Behavior changes can be aggression, mood swings, and suicidality [2]. All these symptoms caused by brain injury influence how the athlete performs on and off the field. Junior Seau's story reminds us about the importance of mental health and how head injuries can affect it.

MENTAL HEALTH

A person's condition in terms of their mental processes and emotional well-being.

CHRONIC TRAUMATIC ENCEPHALOPATHY

A disease of the brain, particularly one that changes the brain structure or function, that results from repeated head injuries.

[1] https://www.bumc.bu.edu/busm/2019/04/10/toward-diagnosing-cte-in-living-people/

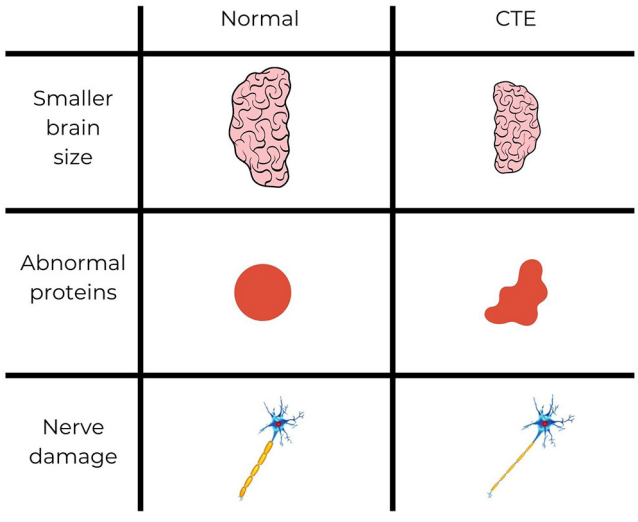

Figure 2

Chronic traumatic encephalopathy (CTE) is a long-term condition that results from repeated head injuries. CTE results in structural changes to the brain that can only be diagnosed after death.

HOW CAN A HEAD INJURY AFFECT MENTAL HEALTH?

Before an Injury Happens

Before an injury even happens, there are factors that can affect how an athlete heals mentally. For example, athletes with a family history of mental health issues are more likely to have such issues themselves following head injury. These issues could include anxiety, depression, and sleep-pattern changes [3]. Another thing to consider is whether an athlete is male or female [3]. After a head injury, females usually have more symptoms than males do. The reasons for these differences are not fully known but could include both biological and social factors. Traditionally, females are encouraged to be more open about their emotions, while males are often expected to be stronger, which may lead males to report their injuries and other symptoms less often than females do.

After an Injury Happens

Let us look at what makes people more likely to have mental health issues after an injury happens. Recovering from a head injury is different for each individual and can be very difficult for some people. The skills people use to deal with difficult situations like serious injuries are called coping skills, and these skills can affect recovery. Athletes with poor coping skills generally have more anxiety, depression, and neurocognitive issues [3]. An example of a poor coping strategy is avoiding normal activities, like not wanting to go to school. This could lead to lower grades and feelings of loneliness and isolation. Athletes who are better able to manage their emotions have less depression and anxiety compared to those who do not cope well in negative situations [3]. Managing emotions is more challenging for some people. For example, Junior Seau had mental health issues such as aggression, depression, and addiction [2]. It was not until after his death that his CTE diagnosis was confirmed. Since then, evidence supporting the link between CTE and mental health has continued to grow.

We also know that doctors who do not diagnose head injuries properly and give treatments that are too strict can make symptoms last longer. If the prescribed periods of rest are too long, athletes may report feeling sad from lack of social interaction, physical activity, and team involvement [3]. So unnecessary treatment could also negatively affect athletes' mental health. After a head injury, it is important to plan the treatment process carefully and specifically for each athlete.

WHAT DOES THE RECOVERY PROCESS ENTAIL?

The best treatment for sports-related head injuries is not fancy medicine but is in fact getting lots and lots of rest. During this rest period, athletes should refrain from driving. They should also limit the use of their brains for purposes like problem-solving, analysis, or

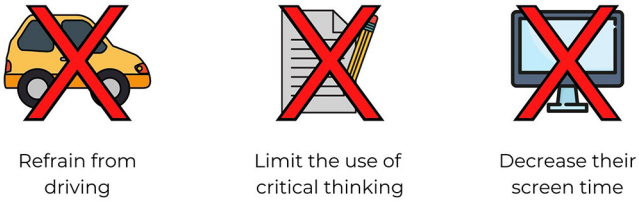

Figure 3

During recovery from a head injury, patients should take a rest period of at least 48 h, in which they follow certain guidelines. These may include limitations on physical activity, critical thinking, driving, or screen time. Refraining from these activities helps reduce brainpower which allows for a faster and better recovery.

creative thinking. Finally, athletes should also decrease their screen time (Figure 3). Athletes should only begin to readjust to daily tasks after 48 h of rest, but this number might vary from person to person. Research shows that, without the initial rest period, athletes increase their chances of getting another injury[2]. Some athletes may need more treatment if their brains have not fully recovered. So, doctors encourage these athletes to attend therapy. Physical therapy allows athletes to work on certain parts of their bodies. For example, they can improve their head and neck movements through exercise and stretches. Athletes may also benefit from psychological therapy, in which an athlete works with a counselor to understand and manage emotions.

What could happen if players return to playing sports before they fully recover? Research indicates that athletes who have had one concussion are 5.8 times more likely to have another similar injury[2]. There are many reasons for this, but it may be due to not taking enough time to recover or to lingering symptoms. Those with a history of concussions are at increased risk for consequences such as losing consciousness, confusion, memory loss, and longer recovery times.

So, when can injured athletes get back to playing their sports? This question does not have one answer, but doctors and sports officials have created return-to-play guidelines to help players return. Instead, doctors suggest that players return to play in stages, under specific guidelines. Using progressive stages can allow doctors and officials to determine the seriousness of an athlete's symptoms. Based on this analysis, athletes can be eased back into playing again. These stages often begin with completing small exercises (push-ups, sit-ups, etc.), progressing to playing without contact, and finally achieving full-contact play.

CONCLUSION

Junior Seau's story shows the importance of taking a head injury seriously, as such an injury can negatively impact a person's entire body and mind. Head injuries have the potential to affect neurocognitive health, long-term livelihood, and mental health.

[2] https://ksi.uconn.edu/emergency-conditions/traumatic-brain-injury/#

Recovery procedures are different depending on the person, which is why it is important for athletes to return only when they are ready. It is important for everyone who plays sports—even kids playing for fun—to protect themselves from head injuries. To prevent yourself from a head injury, you can wear safety gear when playing high-contact sports. You should also be aware of your surroundings. Always remember that playing sports with friends can be fun, but safety comes first!

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CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

HENRY, AGE: 11

My name is Henry. At home I love to game and hang out with my friends and family. At school I like music, math, drama and science. When I am older I hope to go into either a science or medical career.

JAMES, AGE: 10

I am very inquisitive and always question how the world works, and why. I love building things e.g., a salt-powered car and a solar-powered robot, puzzles and reading fantasy books. Last year I learnt how to play the recorder, now I am learning cello and am part of the school ensemble. I train at my swim club and am a blue belt in Taekwondo. In my free time I play computer games and watch TV. And I love holidays!

MATTHEW, AGE: 9

Hi I am Matthew. I am interested in human biology and anatomy. When I grow up I want to be a surgeon. My favorite sport is gymnastics with my friends. I also like playing with cats.

RONAV, AGE: 9

Ronnie is so strong that only onions can make him cry.

VIHAAN, AGE: 10

My parents have always told me if I can be anything Be Kind—kindness changes everything. With progress of science we must remember to not forget to be caring for the world. My curiosity and logic totally make me Mr. Fix It at home and I always ask questions about science like: Why do batteries have to be replaced? And why not make cars run on water?

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I am an undergraduate student at the University of Texas at Austin pursuing a major in Computational Biology with a minor in the Business of Healthcare. I enjoy topics regarding statistics, global health, and neuroscience. In the future, I hope to attend medical school while also pursuing my interests of research. When I am not studying, I love exploring my city, spending time with friends, and trying out new recipes!

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