

Insane in the Brain
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Anyone who has ever played a sport which involves physical contact runs the risk of serious injury. A specific sport's injury which has recently been studied extensively is the concussion in football. Many football players have had long term brain damage causing the National Football League (NFL) to establish protocols and require additional protective gear as preventative measures. The state of Tennessee also has protocols and a program called Project Brain to increase awareness for traumatic brain damage.

STEM can effect this challenge in many ways. New technologies in helmets and turf are being made and put into use. The science of a concussion has been studied to create protocols for head injuries. Innovations in STEM are helping to make the field a safer place.

A concussion happens when a person takes an impact to the head, causing the player's brain to crash against the skull. When that contact is made the brain moves back and forth causing the nerve fibers to stretch and possibly snap. The most damaging type of concussion is a rotational concussion. This occurs when a player receives a blow to the side of the head. The brain moves laterally along with the original forward and back motion.

Dr. Bennet Omalu is a Nigerian-American physician, a forensic pathologist, and a neuropathologist. He conducted a study in 2002 on a man named Mike Webster, who had strange behavior and later died. Dr. Omalu studied his brain and discovered that he had an Alzheimer's like disease called Chronic Traumatic Encephalopathy (CTE). He published the first findings of CTE, which occurs when a person endures multiple impacts to the head over a long period of time. Dr. Omalu also worked with a doctor named Julian Bailes. Dr. Bailes studied retired NFL players' brains which were donated to science. He found that 87 out of 91 had CTE. (Welch)

The Mayo Clinic, a renowned research hospital with locations in Minnesota, Florida, and Arizona, has described the symptoms of CTE: difficulty breathing, impulsive behavior,

depression, short term memory loss, difficulty carrying out and planning tasks, emotional instability, substance abuse, and suicidal thoughts or behaviors. CTE is difficult to diagnose. Most people are unaware if they have CTE because symptoms are similar to multiple other diseases. CTE is normally found when the brain is examined during an autopsy after death. (The Mayo Clinic)

The NFL has established a specific protocol for players with concussion-like symptoms. The first thing that happens during the protocol is the player is taken off the field. The player then sees a physician and a neuro-trauma consultant. League officials and medical personnel review the play to determine possible cause of the symptoms. The NFL classifies concussions with 7 symptoms. These symptoms are loss of consciousness, a blank look or stare, slowness to get up after a hit, clutching head after hit, displacement, and visible facial injuries. If the medical personnel continue to believe the player has a concussion, the player is escorted to the locker room for a complete check up. If a concussion is diagnosed, the player must sit out for the rest of the game. They confirm a concussion by an MRI. (Atkins)

The last step of the protocol is the return to the game of football. There are four parts to this step. The first part is complete rest and recovery. After recuperating with total rest, the player can then begin light aerobic exercise. Once the player can complete the previous step, he can begin strength training. The next step in the process is practicing non-contact football drills. That step leads to the final part, which is full contact football.

In an effort to reduce concussions caused by helmet to helmet contact, the NFL has been forced to institute stiffer penalties for illegal contact. Some of the most well known forms of the illegal contact are helmet to helmet contact and targeting. Targeting is leading a tackle with the

player's head to result in helmet to helmet contact. If a player is called for targeting, he is ejected for the remainder of the game. Roger Goodell, the commissioner of the NFL, seriously fines for any player that commits a targeting penalty.

Multiple technologies have been designed to help reduce concussions in the NFL. Some of these technologies have improved helmet cushioning. Special pads have been added to the helmet to disperse the energy of the hit. This helps reduce traumatic injuries. InSite Response System is a piece of technology that alerts the coach when a player takes a large hit to the head. This system is inside the helmet of the player. (Fuhrmeister, Par. 2)

The NFL has developed turf that is designed to soften the impact when the head hits the ground. A company called Brock International is making pads that reduce shock to go under the turf. This technology has not been used in official NFL games yet, but the New England Patriots, Houston Texans, and Arizona Cardinals are using these pads in their practice facilities.

While these innovations are helping to improve safety for players, football players continue to risk concussions through normal play. Players need to be educated in ways to avoid injury. The players also need to be aware of the dangers to themselves and others while tackling recklessly.

Former NFL players that started playing tackle football before the age of 12 were more likely to suffer symptoms of CTE. At the University of Boston, a study took place where forty-two former NFL players were tested for CTE symptoms. The players were separated into groups. One half started tackle football before twelve, and the other half started after twelve. Those that started before the age of twelve performed worse on all the tests, even after researchers took into account the accumulated years of football played and the age of the players at the time of the

test. These groups differed by as much as twenty percent. The goal of the study was to determine if multiple hits to the head at a critical brain developmental age results in decreased cognitive functioning later in life. Football is the fourth most popular youth sport. Nearly five million youths play tackle football each year, and seventy percent are younger than fourteen.

Tennessee became the forty-fourth state to sign a law to limit youth sports concussions. They created a twenty-minute course called “Concussions in Sports - What You Need to Know” which must be completed annually by athletic directors and coaches. Before you start practice, the athletic staff must sign the concussion protocol. All athletes and their parents must review a concussion and head injury sheet. Any athlete that shows concussion like symptoms has to be removed. The athlete must be examined by a health care advisor and get written permission to return to play. (Tennessee Sports Concussion Law)

Tennessee is involved in a federal funded grant project that supports traumatic brain injury. It is called “Project Brain.” The goal of this project is to improve awareness of traumatic brain injuries. When children suffer a sports-related concussion, a health care provider in Tennessee refers them to a liaison for project brain. The liaison ensures that the child follows proper protocol for returning to school and play. By them doing this it will help decrease long term brain damage.

Football can cause short and long term damage, from concussions to CTE. Whether it is youth or professional football, it is important to have protocols and protective gear to decrease the chance of further injury. With technology we have come a long way, but there are still so many concussions ever year. There are multiple improvements that can be made in the future to prevent traumatic brain injuries that lead to CTE.

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