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Butting Heads: Tacking Football Concussion and Prevention

Mandy McDaniel

Abstract: Hundreds of thousands of sports concussions occur each year in the United States, and almost half of them are the result of a football injury. Even though they may not initially appear serious, concussions can lead to extreme cognitive impairments in those affected. This article highlights the importance of treating concussions properly and educating coaches, parents, and athletes on the value of allowing young athletes to take the time they need to fully recover.

Refuse to Lose. Hit or Be Hit. Respect All, Fear None. These sayings may sound tough to the average person, but for thousands of young athletes in the United States training day in and day out to become the greatest football player they can be, it is a way of life. However, with this tough mentality comes the potential for great health risks. Over 300,000 sports-related concussions occur per year,¹ and about 47% of these concussions result in injuries sustained from football.² Over the history of the sport, the evolution of rules and regulations, new styles of protective equipment, and even major motion pictures have all increased awareness of concussions and their damaging effects. Even with the recent buzz surrounding the topic, the number of athletes reporting concussions is still quite low. A 2013 study by the National Athletic Trainers' Association Journal of Athletic Training indicated only 40% of concussions among a test group of high school athletes were reported.³ When concussions go unreported, the players are likely downplaying the extent of their injuries and are not taking the appropriate steps to proper healing and recovery. Even though many healthcare professionals consider a concussion a mild brain injury, it is still incredibly important to give the body adequate time to heal to avoid further injury. Measures have been taken to create concussion protocols, to raise awareness, and to diminish the tough stigma surrounding football injuries, but some injuries are still not being reported. Athletes need to be aware that ignoring the symptoms of a concussion or not allowing complete recovery can lead to major complications, which can have a substantial impact on players' lives.

A concussion is defined as a bump, jolt, or hit to the head that results in brain movement, causing chemical damage to the brain and its cells.² The chemical changes the brain experiences are commonly known as diffuse axonal injuries.⁴ When a person suffers a concussion, the force of the blow to the head causes the axons of the brain to stretch or tear, starting a complex metabolic cascade and releasing tau protein.² The metabolic cascade includes a release of excitatory amino acids and an influx of calcium and potassium ions into the body.⁴ Calcium ions induce vasoconstriction, which causes reduced blood flow to the brain.⁴ When blood flow to the brain is decreased, the brain cannot function properly. Tau protein can also be found in patients suffering from dementia, stroke, and Alzheimer's disease.² Chronic Traumatic Encephalopathy, or CTE, is a neurodegenerative disease characterized by very high concentrations of tau protein that can only be diagnosed after

death. "CTE is characterized by memory loss, change in demeanor, and suicidal thoughts and actions."² It is often associated with contact sports like football because it is the result of repeated concussions.

Common signs and symptoms of concussions include headache, nausea, vomiting, dizziness, balance or memory problems, and loss of consciousness.² These symptoms are mostly subjective, meaning the patient has the choice of whether or not to report them. In addition to these symptoms, it is important for healthcare professionals, athletic trainers, and athletes to look at further warning signs when diagnosing a concussion. These include inappropriate responses or irrelevant statements, unexpected emotional reactions, and a delay in response to commands. Knowing these warning signs is crucial to proper concussion diagnosis, because neuroimaging techniques, such as computed tomography (CT) scans and magnetic resonance imaging (MRI), will often times appear normal.²

Even after a concussion is diagnosed and treated, it is important to consider how complications, such as post-concussive syndrome, will impact the player's life. In addition to the concussion itself, healthcare providers must be aware of the importance of post-concussive syndrome prevention. Post-concussive syndrome is a condition formed when concussion symptoms are reported after an extended period of injury.⁵ The player typically experiences dizziness and headache immediately after injury but does not report more severe symptoms for a few days to weeks later. Approximately 24% to 84% of concussive injury cases report experiencing post-concussive syndrome within three months of injury. This risk is even greater for those who lose consciousness during a concussion. If not properly treated, post-concussive syndrome can lead to more serious conditions and can be accompanied by anxiety, depression, and fear of permanent brain damage, exacerbating the other symptoms.^{5,6} While treatments like psychotherapy and anti-anxiety medications can help alleviate symptoms of these conditions, the best treatment is to identify and treat the initial concussion.⁶ When players return to the field, they must be more cautious than ever to avoid risk of further injury, as re-injury could cause more serious symptoms or CTE.⁶

Most governing bodies of athletics have a concussion protocol that athletes, coaches, and athletic trainers must follow in the event of a concussive injury. The Indiana High School Athletic Association, or IHSAA, demonstrates a great example of

concussion protocol through their “Suggested Guidelines for Management of Concussion”.⁷ These guidelines begin with the following: “Any athlete suspected of having a concussion should be evaluated by an appropriate health care professional that day. Any athlete with a concussion should be medically cleared by an appropriate healthcare professional prior to resuming participation in any practice or competition.” IHSAA created these rules in the best interest of the athletes, and by following this protocol, an athlete who suffers a concussion is likely to have the best possible outcome.⁷ These guidelines create a uniform culture across the state in terms of how to properly manage concussive injuries. If handling concussions in a safe manner is emphasized at the state level, then it will naturally be promoted to coaches and athletes as well. IHSAA’s policies are derived from the Indiana Department of Education’s Concussion Law (IC 20-34-7).⁸ In addition to the information included in the IHSAA guidelines, the concussion law requires that coaches and assistant coaches complete a concussion certification course. These courses are intended to train athletic coaches on the warning signs of health issues related to heat-induced conditions and concussions, and coaches must become recertified every two years. The Indiana Department of Education offers a myriad of resources on concussion safety, including a frequently asked questions document on concussion safety and state law and a link to fact sheets for different groups of students and parents published by the Center for Disease Control and Prevention (CDC).⁸

Awareness of concussions and their dangers are increasing among football athletes and their coaches, but the stigma within some football positions that players should be tough can get in the way of the recovery process.⁹ The psychological stress many athletes are under as they strive to be the biggest, fastest, and strongest player often leads them to downplay the severity of injuries. In an article published by the Journal of the American Academy of Orthopaedic Surgeons, varsity high school football players were interviewed about psychological themes surrounding the sport. Overall, players often struggle to express emotion or report an injury, because they do not want to be seen by their teammates as weak or to be limited in their play time. It is commonly believed fighting through the pain is an indicator the athlete is committed to the sport. The fear of being replaced by another player is very real for young athletes. One player reported an incident where after crying one time in the locker room, they did not play the rest of the season. Another player reported a coach praising a play through an injury.⁹ While this may not have detrimental physical effects for an injury, such as a sprained ankle, the opposite is true for concussions.

There is hope that the tough stigma surrounding football is diminishing.¹⁰ In addition to increased awareness of concussion safety within state laws and policies, the topic has made an impact on pop culture. The movie *Concussion*, released in 2015, starred Will Smith as Dr. Bennet Omalu. The movie tells the story of how Dr. Omalu, a forensic pathologist, fought to have the National Football League (NFL) stop suppressing his CTE research. The movie raised awareness about head injuries in football, and, though players and coaches are becoming more

educated about the importance of concussion safety and prevention, the nature of the game is still dangerous.

Throughout football’s history, many measures have been taken to ensure the safety of all players. One recent effort to improve safety among athletes is to conduct baseline concussion tests. Baseline tests are basic assessments of brain function that help medical professionals determine whether or not a concussion has occurred.¹⁰ These tests became required in the NFL starting in 2007 and have established a standard of care across the country. It is recommended that baseline tests are given every six months in younger athletes in middle school and high school and once a year in adult athletes.¹⁰ Another measure that could be used to prevent concussions is to identify athletes who may be genetically predisposed to a greater risk of concussion. Athletes that possess the apolipoprotein Eε4 allele may have a higher risk of developing post-concussive syndrome.¹¹ This genetic testing is still in its preliminary phases, but it has the potential to change the way concussions are addressed in the sport.¹¹ In the future, knowing if athletes possess this allele could help them avoid playing certain positions that are more likely to experience a concussion. Also, ensuring that players have properly fitted and approved equipment, like mouthguards and helmets, can reduce concussive forces to the brain.¹¹

Although athletes are becoming aware of the lasting effects of concussions, some injuries are still not being reported. Studies suggest approximately 66% of concussions are not reported because the athlete did not think the injury was serious enough.¹ Athletes need to be aware that ignoring the symptoms of a concussion or not allowing complete recovery can lead to major complications, which can have a substantial impact on players’ lives.¹ In order to avoid post-concussive syndrome and its consequences, education must be continually improved among players, coaches, athletic trainers, and parents. In addition, football athletes must be encouraged to be open and honest when it comes to any injury, especially if they experience a blow to a head and have suspicions of a concussion. The tough stigma surrounding football needs to diminish, as it is better to appear weak than to suffer the lifelong effects of ignoring a concussion. Further educating players, coaches, and other athletic personnel on the importance of proper concussion recognition and encouraging appropriate treatment will help prevent complications and improve the lives of athletes.

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