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# Concussion Prevention and Treatment in American Football for Professional and Non-Professional Athletes

by Chelsea E. Romney

*In the past few years, the National Football League (NFL) has dealt with considerable controversy regarding the effects of head injury with its professional football players. Head injuries suffered during hard contact sports have now been connected to many psychological issues such as depression, dementia, substance abuse, changes in personality, and even suicide. Concussions suffered in the NFL and at the collegiate level are not the only concern; in fact, many high school and younger-aged athletes are suffering from football-related injuries as well. In order to ensure the safety of professional and amateur football players, adjustments must be made to current Return to Play (RTP) guidelines and their application, including providing proper medical attention on the field and the overall attitude toward protection against potentially harmful brain trauma.*

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**F**ootball is a highly cherished and under-criticized part of the American tradition. With over 111.5 million fans viewing the Super Bowl last year, it is clear that many Americans consider football a part of our culture and enjoy watching this hard contact sport. However, the dark side of player injury is rarely seen through the distractions of tailgating, cheerleaders, and hometown pride. In a recent autopsy diagnosis of an NFL star who, prior to committing suicide, requested his brain be donated for study, there were interesting effects. The disorder found in the retired player is described by Omalu, Hamilton, Kamboh, and DeKosky (2010) as “representing the cumulative, long-term neurologic consequences of repetitive concussive and sub-concussive blows to the brain, which may be sustained in contact sports” (p.42) referred to as Chronic Traumatic Encephalopathy (CTE). Some of the symptoms of this diagnosis include early onset dementia, paranoia, premature Alzheimer's, social reclusion, depression, domestic violence, and, in extreme cases, suicide (McCrea & Powell, 2012). The key discriminating factor for the development of this disorder is not one concussion, but rather multiple concussive-like blows. Sustaining multiple consecutive concussions is not uncommon for NFL players. In fact, it is somewhat in the nature of the game. This is unfortunate because it is the very plurality of concussions that cause the aforementioned damaging neurological effects in football players. If more steps were taken to reduce the number of concussions suffered within short periods of time, the amount of psycho-

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logical damage suffered by NFL players would almost definitely decrease.

It is imperative to note that the negative effects of football-related concussions do not affect only NFL players. Young athletes can also suffer from a traumatic brain injury (TBI), and therefore can be put at risk for the neurological, physical, and mental hardships that often accompany such an injury. Despite the potential consequences and the increasingly widespread knowledge of football's risks, many children and young adults are still playing football. This is unfortunate because of the likelihood of brain injury in these young athletes. Yard and Comstock (2009) report, "About 47 percent of high school football players sustain at least one concussion each season, and 35 percent of those who reportedly suffered from a concussion actually sustained two or more in the same season" (p. 888). These numbers are disturbing when considering that the effects of even a mild TBI in an adolescent include memory loss, inability to concentrate and retain information, and even depression and suicidal thoughts (Elbin et al., 2012). These symptoms can make it difficult for young athletes to perform well in school and form healthy relationships with peers. It may not be worth the risks when considering that only "approximately .08 percent of high school senior boys playing interscholastic football will eventually be drafted by an NFL team" (NCAA research, 2013, p. 2). With such high percentages indicating the likelihood of head injury and considering the negative effects that often occur as a result, the current methods of concussion treatment and prevention in non-professional football may be detrimental for young athletes.

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Fortunately, proper treatment and prevention of concussions is possible, especially for adolescents. Yard and Comstock (2009) write, "This complex issue should be a high priority for sports medicine professionals, parents, coaches and sports administrators, who must work together to improve concussions management" (p. 892). The concerns surrounding CTE and mild TBIs in football will be addressed in the following literature review. The consequences of CTE will be analyzed using information derived mostly from peer-reviewed journal articles. Some data will also be cited from mass media articles and quotes drawn from topic-related interviews. The information collected should provide an informed view of CTE in NFL players as well as an in-depth look at concussions in younger athletes and finally propose a new, safer, more realistic mindset for American football fans.

### TBI Related to the National Football League

For the average individual, most brain-related injuries will result in hospitalization or medical attention. However, football players differ in their typical treatment of head trauma in a few different ways. The first is that treatment of head trauma differs between football and other hard-contact sports. In boxing, for example, head trauma that results in a temporary blackout or loss of consciousness is considered the end of a fight with only a matter of seconds before a winner is called. However, in football, when a player regains consciousness they are often expected to return to the game as quickly as possible (Dekosky, Iknomovic, & Gandy, 2010). Secondly, athletes are expected to be playing, or ready to play throughout the entire game, unless *physically* unable. Yard and

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Comstock (2009) explain this phenomenon by pointing out the difference between a “functional injury” and a “debilitating injury” (p. 890). Head trauma is considered a “functional injury” because, unlike a sprained ankle or broken arm, a player who has suffered head trauma may not appear physically hurt or be unable to perform the movements necessary to continue playing in the current game. Due to protection provided by helmets, the majority of head injuries in football occur with no visible damage to the skull. However, head injuries can most certainly be suffered without a skull fracture. A concussion is, in fact, the unnecessary or violent movement of the brain in the cerebral fluid (Bodin, Yeates, & Klamar, 2012). Because mild traumatic brain injury is relatively invisible compared to other physical injuries, it receives less attention and therefore often not enough recovery time.

### **Return to Play Guidelines**

Recovery time for athletes with a head injury is much more important than is often considered because of the negative effects that specifically accompany successive concussions. Injured athletes who play immediately following a concussion experience “slowed reaction times, which may result in an increased risk of re-injury” (Yard & Comstock, 2009, p. 889). Studies concerning recovery time resulted in the publication of official Return to Play (RTP) guidelines (Yard & Comstock, 2009). These include specific “grades” for concussions and ideal amounts of time needed for recovery. They are designed to protect players from the negative effects of successive head injuries. The publication of RTP guidelines has improved knowledge of the dangers of multiple concussions; unfortunately,

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as Casson, Pellman, and Viano (2008) write, the grading system for concussions can be prone to error, and any diagnostic missteps concerning head injury come with a price. Failure to diagnose a concussion can cause an athlete to suffer more injuries, as the brain becomes more prone to movement within the skull.

### Chronic Traumatic Encephalopathy

The culmination of the effects of successive concussive blows can manifest into Chronic Traumatic Encephalopathy (CTE). With only nine confirmed cases, six of which are in retired football players, this disorder can specifically apply to the unique head injury cases that occur in NFL players. Omalu et al. (2010) describe this disorder as the “chronic neurodegeneration following repeated episodes of mild traumatic brain injury” (p. 41). CTE is a syndrome of chronic dementia characterized by impairment of intellectual functioning including language, visuospatial skills, personality, cognition, emotion, and mood disorders (Yard & Comstock, 2009). The symptoms of CTE can be life-altering and in some cases, fatal. In fact, one of the most publicized results of CTE in retired NFL players is suicide.

**Suicidal tendencies of CTE patients.** According to the American Foundation for Suicide (2015), men belonging to the racial group ‘Black’ make up just 5.4% of suicides, whereas white males account for 70% of suicides in the United States. These statistics indicate that the typical NFL player does not fit the description of those most prone to suicide, with NFL players being 68% African American and approximately 20% white (Powell-Morse, 2014). Yet Conely (2012) notes that there has been multiple suicides committed

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by retired NFL players. This includes familiar names such as Dave Duerson, Terry Long, Andre Waters, and, most recently, Junior Seau of the San Diego Chargers. It is arguable that these cases of depression resulting in suicide could be connected to the retired player's career-end or a drastic change of lifestyle and salary. However, this may only be a small risk factor, whereas CTE is directly caused by multiple concussions and may be more of the root cause for the retired player's depression and various other psychological symptoms, and suicidal tendencies.

**Living and dying with CTE.** Omalu et al. (2010) describe a case study of a retired NFL player, who before committing suicide, requested his brain be studied. The autopsy revealed that the player's brain tissue had components common to other cases of neurodegenerative disease diagnoses. A behavioral profile was also compiled to examine the player's symptoms. About five years after retirement, the patient began showing signs of dementia and was becoming less and less like his normal self. The authors believe that these psychological hardships are a result of his numerous concussions. The deceased athlete reportedly lost count after his fifteenth concussion and failed to report most of them to coaches, teammates, or physicians. This is not uncommon for NFL players. Retired Patriots linebacker, Ted Johnson, believes his current state of depression, beginnings of dementia, and substance addiction can be attributed to the countless hits he endured throughout his career. As he stated, "Officially, I've probably only been listed as having three or four concussions in my career, but the real number is closer to 30" (quoted in MacMullan, 2007, p.1). It is clear that the psy-

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biological effects suffered by football players are not simply due to concussions, but rather the frequency and poor treatment of concussions.

### Concussion Treatment for High School Football Players

Although NFL players usually understand the risks involved and earn a sizable salary to endure the mentioned hardships, there are younger, non-professional athletes who are sometimes less informed and more at-risk than professionals. Unfortunately, the majority of concussion research has focused on college and professional athletes, although high school players make up the single largest cohort of football players and account for the majority of sport-related concussions (Elbin et al., 2012). Johnson (2012) warns, "There is a gap in the medical literature concerning the long-term effects of repetitive concussive and subconcussive brain trauma in the population of youth athletes who do not go on to play at professional or collegiate levels of sport" (p. 180). Because most of these young athletes will not make football their career, it is imperative that while playing high school sports they are not put at risk for potential neurological and psychological defects that could affect their quality of life. Most parents would agree that high school athletics promote self-discipline and build character in young players; however, these benefits are only advantageous if proper precautions are taken to protect young athletes and their future.

### RTP in High School Football

Fortunately, the aforementioned RTP guidelines seen in the NFL also apply in most non-professional settings. However, ac-

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According to Yard and Comstock (2009), "less than half of high school athletes are actually abiding by RTP regulations" (p. 889). This fact is shocking when you consider that "TBI is the leading cause of mortality and disability among young individuals in high income countries" (Kimbler, Murphy, & Dhandaphani, 2011, p. 797). To help combat this statistic, it is important that efforts are made to reduce these risks effectively and to increase education on the actual neurologist-recommended guidelines for concussion treatment.

According to Casson et al. (2008), "Most reports of high school or college athletes say they tend to take up to 7 days to recover from head trauma whereas the average NFL recovery time is 1 to 2 days" (p. 235). Although this demonstrates longer recovery times for these young athletes, a week is still short compared to the amount of time that is actually needed. According to Henry et al. (2011), "Most brain injuries are widely believed to take about 10 days for recovery, however research suggests that a full recovery can take up to three months" (p. 16). Neurologists make it clear that proper treatment of concussions is necessary, especially for young athletes. Furthermore, due to the commonality of concussion, safety precautions should be taken seriously by students, athletic staff, and parents.

### Discussion

It is apparent that the effects of head injuries due to football can cause many negative side effects in an injured player's life. Because of the recent lawsuits, retired player suicide, and harmful effects of brain injury, the NFL has already begun to make strides in concussion treatment; however, there is still much to be done before players are truly protected from brain injury. In order to insure the

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safety of athletes, changes should be made to the current state of RTP guidelines and their reinforcement. Also, the overall attitude toward head injury should be one of seriousness and caution. More creative methods for concussion reduction could also be implemented, such as harsher penalties for hard head hits, proper starting play position, and even new views on proper padding and helmet use.

### Neurologists on the Football Field

It is also important to consider the medical attention provided on the field for injured athletes. Although the current medical aids on the sideline are required to have training in head injury and RTP guidelines, it seems that due to the seriousness and low detection rate of mild brain injury, it is necessary for a neurologist to be present at games. Currently, in the NFL and most collegiate teams, a doctor and physical therapist are present to assess all injuries including possible concussions. There are some issues with this. First is that lower-grade concussions may be relatively hard to detect, especially immediately after they are suffered, because of the lack of symptoms they cause. Even doctors can have some difficulty in diagnosing a concussion on the field; this is demonstrated by the large amount of players that return to games and are later tested to prove that one or more concussions had indeed been suffered. In high school, this situation becomes even more precarious with only an athletic trainer fulfilling the role of on-field brain injury assessor.

**Bias in sideline medical attention.** Along with concussion diagnosis issues, bias can also prove to be an issue. The sideline med-

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ical team can often be emotionally invested in the result of games. Being associated with a successful team may prove to be a motivator for keeping concussed players in the game if it means a possible win. Requiring a neurologist that has no association to the school or athletic department to be on the field at all times would enable this person to act as a referee with no team affiliation. Although knowing a patient's history can be beneficial, the person treating the concussion should not gain anything from a particular player returning to a game. Football organizations such as the NFL, NCAA, and high school levels hire referees for games; this same process should occur for hiring neurologists. To solve the issue of player history, detailed files documenting past head injuries and baseline test levels should be kept for neurologists to view if needed. The presence of a neurologist may not prove to be beneficial in prevention of concussions suffered; however this may prove to be effective in preventing athletes from suffering the uniquely damaging effects of multiple concussions in one game.

### **Adjustments to Football Rules and Play Methods**

Alongside concussion treatment, more preventative methods could be created, such as the use of penalties for head-related tackles in games and changes in starting positions. First, the starting position of football is a bent over, headfirst stance. Much like a runner's starting position, this stance is used so players are near to the ground allowing them to acquire speed very quickly. However, this stance increases the likelihood of a head-hit and, considering that they are starting out with speed, may result in more severe blows to the head. Theoretically, a standing-up beginning position

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like that used in many other sports would most likely result in a slight decrease in head injury. Also, stricter rules and penalties should be enforced discouraging the use of heads in tackling or the targeting of other's player's heads in tackling. Furthermore, there should be zero tolerance by coaches and referees for intentional blows to the head or use of the head in tackling methods.

**Changes to padding and protective gear.** According to Farace et al. (2010), there are more concussions in American football than in rugby. This is surprising, considering the fact that rugby players do not wear protective headgear like football players. Why, then, do they experience significantly lower concussion rates? There are a few possible reasons for this. First, rugby differs from football in that tosses are made underhand, therefore balls do not reach the speed of balls in American football, decreasing the need for runners to reach high speeds to catch them, which may result in lower impact collisions. However, rugby is similar to American football in the physical contact aspect: tackling is a large part of both sports. When tackling, the helmet's key role is protecting the skull and not necessarily the brain. Mild brain injury is suffered because of the brain's movement inside the skull, not damage to the skull's actual structure. The hitting and moving of the brain against the skull is what causes concussion. Due to the steady rate of regular concussions, it would appear that helmets currently being used in football are not getting the job done. If football continues to be a hard contact sport, it would be wise for engineers to continue working on new helmet technology—and perhaps, someday, they may be able to create a helmet that doesn't allow as many concussions to occur.

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Another solution, although it may be controversial and innovative, is the discontinuation of helmets altogether. Paradoxically, the absence of helmets may prove to be highly effective in helping to decrease brain injuries. Simply, if there is no protection over one's head, they will probably be more hesitant to use it in tackling. It is very likely that all options, although pioneering and sometimes mystifying, are necessary to consider in order to maintain the safety of athletes that play the beloved sport of football. It is important that we leave no stone unturned when it comes to the safety of football players.

### Conclusion

Based on the provided research, it is clear that innovative and creative methods for protecting athletes against concussions are necessary and long overdue. Clearly, the concern about sports concussion and its risk, whether at the professional, college, or youth levels, continues to escalate by means of the controversy surrounding suicides and high school football tragedies. Fortunately, the recognition of this public health issue is growing in intensity. Ironically, the evolution of youth sports is resulting in participation in sports at earlier ages than ever before. This has led to an increase in concussive events throughout the lives of children and teenagers (Shatz & Moser, 2011, p. 1057). Health care professionals, including neuropsychologists, who are uniquely qualified to provide support in this area of expertise, will be of great necessity in the coming years for football players. Also, inventors and sports equipment designers will be crucial in the safety innovation process which football must undergo. Now more than ever, qualified individuals

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need to step in, in order to fix the concussion problem facing professional athletes, and—more importantly—our youth.

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