

Effects of Repeated Head Trauma Causing Mental Health Problems Including Chronic Traumatic Encephalopathy (CTE) in Athletes

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Abstract:

This paper focuses on the effects of repeated head trauma in athletes and how these repetitive blows to the head are causing a range of mental health problems. The primary focus, in terms of problems addressed, is chronic traumatic encephalopathy (often referred to as CTE) in the population of athletes, especially those participating in contact and combat sports. The disorders covered are caused by the cumulative effects of both concussive and sub-concussive blows to the head over a period of time.

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Concussions are the result of hard hits to the head, and a large portion of the population will suffer a concussion at least once in their lifetime. Methods of sustaining concussions include car accidents and falls; however, the largest segment of the population affected by concussions is professional athletes. Concussive and sub-concussive hits have large, adverse effects on the overall mental health of athletes, including the immediate effects of repetitive hits such as bruising, hemorrhaging, inter-cranial bleeding, and swelling of the brain. Long term effects include dementia, depression, and chronic traumatic encephalopathy.

Concussions and head injuries are “an important public health concern, as each year more than 1.2 million Americans suffer [a] head injury” (3:719). The prevalence of head injuries is important because traumatic brain injuries have been identified as a “potential risk factor for the occurrence (or early expression) of neurodegenerative dementing disorders, including Alzheimer’s disease and Parkinson’s syndrome, and other psychiatric disorders such as clinical depression” (3:719). However, athletes are disproportionately affected and with a “relatively high rate of concussive brain injuries in contact sports... [with] more than 300,000 sport-related concussions, many of which are recurrent injuries, occur[ring] annually in the United States” (3:720).

Chronic traumatic encephalopathy is a neurodegenerative disease caused by repeated blows to the head. In the mid-to-late 1900s, chronic traumatic encephalopathy was commonly known as “punch-drunk disease” because it was commonly found in boxers. In boxing, the preferred method of victory is knocking out an opponent. In essence, this makes the goal of

boxing “inflict[ing] a concussion on one’s opponent, preferably with loss of consciousness for longer than a count of 10” (6:169). Concussions are encouraged in this sport; therefore, boxers take punches to the skull on a routine basis and suffer many documented and undocumented concussions during their careers because of it. Even if a boxer knows he or she has sustained a concussion, the culture of the sport, which correlates pain and injury to weakness, is cause for the boxer to hide the concussion. With a lower likelihood for concussed boxers to seek treatment, a high rate of permanent brain damage and a high presence of boxers with chronic traumatic encephalopathy is prevalent. The destructive and counter-intuitive concept of traumatic brain injuries being ignored because these injuries are a part of the sport is detrimental to the health of these athletes world-wide. Another effect of concussive and repetitive hits to the head in boxers is Parkinson’s Syndrome. Muhammad Ali, arguably one of the greatest boxers ever, announced that he was diagnosed with Parkinson’s Syndrome in 1984. Research has shown that “the risk for development of [Parkinson’s Disease] increased with increasing number of head injuries” (7:12). Ali fought from his youth until 1981 and won the heavyweight title three times and lost only five times in his pro career. Ali’s record shows that a boxer does not have to lose or be knocked out (Ali never sustained a knockout) to experience the effects of traumatic brain injury. Ali sustained hundreds, if not thousands, of blows to the head and the repetition lead to the development of Parkinson’s Syndrome.

In recent years, chronic traumatic encephalopathy has gained large notoriety due to players in the National Football League being posthumously diagnosed with the degenerative disease. Records state that “between February 2008 and June 2010, there were 321 known

[professional American football] player deaths and the brains of 12 of the 321 underwent postmortem neuropathological examination at Boston University Center for the Study of Traumatic Encephalopathy. All 12 examined neuropathologically showed evidence of [chronic traumatic encephalopathy].” (2:180). Football relies heavily on contact and values hard-hitting players, a practice that increases the likelihood of concussions. Compared to boxers, football players are more likely to be diagnosed with concussions; however, these athletes suffer repetitive sub-concussive hits that go undiagnosed. Research is still unclear in “whether [chronic traumatic encephalopathy] is more likely to occur following a small number of severe head injuries, a large number of subconcussive injuries, or other forms of head trauma.” (2:184). The reason the research is unclear is due to most of “the research studying the long-term consequences of [traumatic brain injury] has focused on severe [traumatic brain injury], whereas studies addressing outcomes of recurrent mild [traumatic brain injury] on neuropsychiatric disorders have been overlooked” (4:904).

The occurrence of chronic traumatic encephalopathy in high profile athletes, such as Junior Seau, has brought a media storm of attention to the degenerative disease and speculation has heavily outweighed the research that has occurred in the field. Research is in very early stages regarding the exact cause of chronic traumatic encephalopathy. What is known is that repeated head trauma is necessary for chronic traumatic encephalopathy to occur. All documented cases of this disease have occurred in athletes with a history of concussions. It is known that “repetitive trauma is necessary for incurring [chronic traumatic encephalopathy]; however, there are numerous individuals with a history of repeated brain trauma who do not

have [chronic traumatic encephalopathy]” (1:5). Evidence indicates that concussions alone do not cause chronic traumatic encephalopathy, and other factors are required to cause the debilitating disease. Several ideas have been brought forward as to what contributes to developing chronic traumatic encephalopathy including the age at which the impacts begin, number of sub-concussive hits in addition to concussive hits, how the player is hit, and whether concussions were allowed to heal prior to being re-exposed to further head trauma.

Researchers are examining whether “the age at which the brain starts being exposed to trauma... in determining whether or not an individual develops [chronic traumatic encephalopathy].” (1:5). It is possible that an individual may have an exponentially higher probability to develop chronic traumatic encephalopathy if the concussive and sub-concussive hits begin earlier in life. With no definitive results in the foreseeable future, the jury is still out. However, if the hypothesis that age impacts the development of chronic traumatic encephalopathy is correct, we could see a rapid decline in the number of kids participating in contact sports as young children. Avoiding sports would also impact children’s health and increase childhood obesity, place some kids in a more dangerous after school environment, and lead to a decline in the values these sports are meant to instill in children. If age is the critical factor, America’s youth would have to sacrifice a lot to ensure long term health free of chronic traumatic encephalopathy.

While researchers and doctors are comparing concussion history to prevalence of chronic traumatic encephalopathy, they are not able to readily look at a player’s history of sub-concussive hits. These hits are generally symptomless and go untreated, allowing the athlete to

continue playing or practicing normally, taking more hits which compounds the injury. When given enough time, sub-concussive hits have the potential to create a greater overall impact on an individual than a single concussion would. Sub-concussive hits were a driving force behind the new practice guidelines in the National Football League. The National Football League's Player Association worked out the new guidelines in the new collective bargaining agreement, limiting contact in practice and promote the well-being of the players over success of the teams. This is a very big step in protecting athletes from long-term mental dilapidation due to head trauma.

There are many physical manifestations of chronic traumatic encephalopathy. Chronic traumatic encephalopathy is described as a "clinicopathological entity that includes mood, personality, cognitive, and behavioral changes, and motor symptoms." (5:139). Personality symptoms of the disease are depression and anxiety which are often self-medicated and can lead to alcohol abuse, the use of marijuana, addiction to hard drugs, and the abuse of prescription medications (predominantly pain pills). Early onset dementia is another result of chronic traumatic encephalopathy; "a minority of cases with neuropathologically-documented [chronic traumatic encephalopathy] developed dementia before death; the relative infrequency of dementia in individuals with [chronic traumatic encephalopathy] may be due in part to the fact that many individuals with [chronic traumatic encephalopathy] have either committed suicide or died from accidents or drug overdose at an early age." (2:181). An individual may also experience mood swings and, in some cases, can become suicidal and/or homicidal. Individuals who commit suicide are described to not know where they are or what has happened to them, and they are regularly confused, depressed, and angry. Results from recent studies go as far to

“question how effectively retired professional football players with a history of three or more concussions... meet the mental and physical demands of life after playing professional football” (4:906). Sustaining multiple concussions throughout a career can significantly increase the difficulty of life after retirement, and in addition to having a difficult time functioning after retirement, an athlete with chronic traumatic encephalopathy will often experience a loss of motor functions and coordination, or will experience trembling and other involuntary muscle movements.

The link between concussions and long term depression has become an emphasis of recent research. Studies of retired American professional football players support the notion that “lifetime prevalence of depression and feelings commonly associated with a depressed state increases as a function of previous head injury exposure” (4:906). The results of studies have also found that “those with a history of depression are more likely to be restricted by muscle and joint pain, feel helpless, have difficulty sleeping, and, in general, feel as though their health is declining. Individuals with a history of depression also reported more alcohol-related problems and were more likely to be separated or divorced” (4:906). This coincides with the usual effect of depression which “can affect one’s ability to function in multiple realms, including interpersonal relationships, productivity at work, and self-care” (4:907). While there is a definite link between traumatic brain injury and depression present, the method of depression forming in the wake of concussions can only be hypothesized. Preliminary findings show a link between damage caused by concussions, creating “diffuse lesions in the brain, depending on the

mechanism of injury. These lesions result in biochemical changes, including an increase in excitatory neurotransmitters, which has been implicated in neuronal loss and cell death (4:907). With the continuation of contact sports, a process that eventually leads to lifelong depression caused by the “initial loss of neurons, which could be compounded by additional concussions, eventually leading to the structural changes seen with major depression” (4:907) begins.

All the information available on chronic traumatic encephalopathy is fairly recent as “research related to [chronic traumatic encephalopathy] is in its infancy... areas of research remain, including investigations of [chronic traumatic encephalopathy]’s epidemiology, specific risk factors... underlying disease mechanism, and the ability to diagnose [chronic traumatic encephalopathy] during life.” (1:8). Despite the large amount of media attention and a recent increase in the number of contributions to further research “scientific knowledge regarding [chronic traumatic encephalopathy] has progressed more slowly, i.e., at a typical speed of scientific discovery.” (1:8). However, in recent months (February 2013), researchers at the University of California, Los Angeles, published a journal showing significant progress in the diagnosis of chronic traumatic encephalopathy. The research was accomplished through the evaluation and testing of five retired National Football League player the preliminary findings suggested that “FDDNP-PET [the method of detection] could facilitate early recognition and intervention of trauma related neurodegeneration through premorbid detection.” (5:143). This is one of the main goals of research into the disease because “providing a non-invasive means of early detection is a critical first step to developing interventions to prevent symptom onset and progression.” (5:143-144). The next step is to outline a longitudinal study encompassing a much

greater pool of individuals exhibiting symptoms of chronic traumatic encephalopathy. This study will help solidify the results from preliminary testing or steer research in a different direction if the results are contradicting or inconclusive.

Traumatic brain injuries are caused by hard blows to the head and disproportionately affect athletes participating in contact sports. Repeated hits to the head can cause depression, dementia, Parkinson's Syndrome, chronic traumatic encephalopathy, and countless other diseases and disorders. The newest and least understood is chronic traumatic encephalopathy; it is a degenerative disease and coincides with depression, anxiety, mood swings, early onset dementia, and can result in an individual committing suicide. While it is known to be caused in part by severe and repetitive head trauma, other factors are necessary for the disease to materialize in a way to cognitively affect the victim. Research is still in its early stages and has only scratched the surface of the effects of traumatic brain injuries; however, advances are being made, including a prospective method for a living diagnosis of chronic traumatic encephalopathy rather than just posthumously; this is the key to understanding the causes and full ramifications of the disease.

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